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SYSTEM/PROJECT/PRODUCT: VMS SIGN

Urban VMS Handbook

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FUNCTION: Engineer

This Document is Electronically Held and Approved

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SAFETY WARNINGS

In the interests of health and safety, when using or servicing this equipment the following instructions must be noted and adhered to:

- (i) Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical/electronic equipment are to be allowed to use and/or work on the equipment. All work shall be performed in accordance with the Electricity at Work Regulations 1989 and the relevant Highways Agency procedures of test and maintenance.
- (ii) Such personnel must take heed of all relevant notes, cautions and warnings in this handbook, and any other document or handbook associated with the equipment including, but not restricted to, the following:
 - (a) The equipment must be correctly connected to the specified incoming power supply.
 - (b) The equipment must be disconnected/isolated from the incoming power supply before removing protective covers or working on any part from which protective covers have been removed.
 - (c) **ELECTRIC SHOCK RISK** – Hazardous voltages of mains potential are present within the equipment. Observe any warning labels and do not remove any protective covers unless absolutely necessary. Equipment must not be operated with covers removed unless at least two persons are present.
 - (d) Any power tools must be regularly inspected and tested.
 - (e) Any personnel working on site must wear the appropriate protective clothing, e.g. reflective vests, etc.
- (iii) The equipment must be correctly connected to the incoming mains supply.

- (iv) The UVMS Processor uses a Lithium battery for memory backup. STCL Code of Practice 526 must be adhered to for handling the UVMS Processor PCB.
- (v) When the UVMS uses sealed lead acid batteries, care must be taken in handling these to prevent a short circuit condition occurring on any of the lead acid cells.
- (vi) Any batteries used in this equipment should be treated with respect. When a battery is replaced for any reason, do not dispose of the old one in normal waste as it may contain toxic chemicals.
 - DO NOT puncture
 - DO NOT dispose of in any fire
 - DO NOT attempt to recharge batteries except where specifically permitted.
 - Refer to Company Code of Practice CP 526 for handling lithium batteries.
- (vii) All normal precautions as laid down by Company Safety Policy are applicable particularly with regard to safe working at the heights at which these signs are mounted. Ladder supports are provided behind the access doors on all the sign types. Ladders, when used, should be lashed to these supports.
 - (a) Any ladders used must be inspected before use to ensure they are sound and not damaged.
 - (b) When using a ladder, before climbing it, ensure that it is erected properly and is not liable to collapse or move. If using a ladder near a carriageway ensures that the area is properly coned and signed.
 - (c) When carrying out maintenance inside clam-shell type UVMS particular attention should be paid to the operation of the gas struts before entering the sign. Specific attention should also be paid to the correct operation of the gas strut locking mechanism.

Statutory Approval Maintenance Provision (SAMP)

22/04/99

1. Product Reference

Variable Message Sign (150 Flip Disc, and 150 & 240 LED character signs)

2. Specifications

The Variable Message Sign is designed to meet the following Highways Agency specification:

TR2136

3. Installation and Commissioning

Methods of Installation and Commissioning are detailed in the Siemens Traffic Control document:

667/HB/27770/000 Urban VMS Handbook.

4. Spares and Maintenance

All Maintenance and Repairs should be carried out in accordance with the Maintenance sections of this handbook, using only the listed Spare parts or spares kits.

5. Modifications

There are no approved modifications, with the exception of those listed in the following Siemens Traffic Controls document:

667/HB/27770/000 Urban VMS Handbook.

6. Warning

Use of components other than those permitted above or modifications or enhancements that have not been authorised by Siemens Traffic Controls Limited may invalidate Statutory Approval of this product.

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1. INTRODUCTION

1.1 What is covered

The purpose of this handbook is to give a general description and specification of the Urban VMS (UVMS) Signs and the procedures for installation and commissioning. Also provided is guidance on testing and maintenance procedures.

N.B. Two and four line 320mm flip disc and LED signs used as Urban signs are similar to 320mm Motorway signs. Therefore refer to the VMS Motorway Handbooks 667/HB/24612/000 and 667/HE/24612/ETC for a description of these signs.

Section 1 provides an introduction to the handbook.

Section 2 introduces the UVMS system in general terms.

Section 3 gives a general description of the hardware used in UVMS.

Section 4 provides a complete list of the facilities that can be provided by the UVMS.

Sections 5 to 7 give information on the installation, commissioning and maintenance of a UVMS with flip dot or non-intelligent characters, including part numbers and spare parts.

Section 8 to 10 give information on the installation, commissioning and maintenance of a UVMS with intelligent characters, including part numbers and spare parts.

Appendix A describes the use of the Maintenance Terminal.

Appendix B consists of an Installation/Commissioning Checklist.

Appendix C contains drawings relating to the UVMS Signs.

Appendix D has a Maintenance Kit family tree, showing relevant part numbers.

Appendix E gives the minimum specification for the Maintenance PC.

1.2 How to find your way around

The handbook is split into several major sections each covering a complete topic. These are described in section 1.1 above. The table of contents at the front of the handbook lists topics in the order that they appear, together with their page number. A subject and keyword index is provided at the end of this handbook allowing quick location of information as required.

If you do not know where to find the information you need on a particular subject, use the table of contents if you are interested in a major subject area, or the index for specific references to a particular topic (say fuses).

1.3 Reference Documents

667/HE/20664/000	Installation & Commissioning Handbook No.4 Installation Testing (General)
667/HF/24612/ETC	Operational Installation Method Statement and Conditions of Working
667/HF/26180/ETC	Operational Installation Method Statement and Conditions of Working – Urban VMS
667/HB/24612/000	General Handbook for Flip Dot VMS
667/HE/24612/ETC	Installation, Commissioning and Maintenance Handbook for Motorway VMS Signs
4/CC/1010/420	Method Statement
BS7671	16th Edition IEE Regulations
	HSE Guidance Note Storage of Packaged Dangerous Substances
	Control of Pollution Act
	Environmental Protection (Duty of Care) Regulations 1992
	Control of Substances Hazardous to Health Regulations 1988.

1.4 Definitions

EMC	Electromagnetic Compatibility
EMI	Enhanced Matrix Indicator
EMS	Enhanced Message Sign
EPROM	Erasable Programmable Read Only Memory
ESD	ElectroStatic Discharge
HA	Highways Agency
IEE	Institute of Electrical Engineers
LED	Light Emitting Diode
LSB	Least Significant Bit
MSB	Most Significant Bit
PCB	Printed Circuit Board
Pixel	One “dot” element in a 7 x 5 matrix display
PLD	Programmable Logic Devices
PROM	Programmable Read Only Memory
PSU	Power Supply Unit
QB	Quick Blow
RS232	EIA Data Communications Interface
RS485	EIA Differential Data Communications Interface
SAMP	Statutory Approval Maintenance Provision
SB	Slow Blow
SIESPACE	Siemens Car Park Guidance System
STCL	Siemens Traffic Controls Limited
UVMS	Urban VMS
VMS	Variable Message Sign

1.5 Safety Precautions

When installing, testing, commissioning or maintaining the sign on site, care should be taken to comply with the safety aspects of MCH1043.

Refer to the Safety Instructions and the Statutory Approval and Maintenance Provision which can be found on pages 2 to 4 of this handbook.

1.6 Issue History

1.00	05/03/01	First formal Issue
2.00	16/11/09	Update

1.7 Issue State

Pages	Current Issue	Type	Part ID
1 to 111	1.00	AMW	667/HB/27770/000
1 to 111	2.00	AMW	667/HB/27770/000

2. EQUIPMENT DESCRIPTION

The Urban VMS (UVMS) is used to display textual messages, and is a development from the Motorway VMS but based on a smaller character size. The signs currently use LED technology to display information on a dot matrix display area, arranged as individual 7 x 5 dot matrix characters.

An earlier generation of UVMS used small flip dot displays.

The primary applications of UVMS are to display information about traffic and weather conditions to drivers in the urban environment, and to provide parking space information on car park guidance signs.

The UVMS system allows for control from several different sources, including the SIESPACE parking guidance system, a stand alone local controller or remote control via a modem and telephone connection.

The UVMS design allows many different requirements to be catered for. Customisation of the sign is possible in all areas during the manufacturing process.

There are three generations of UVMS:

1. Flip dot displays with row and column driver PCBs.
2. LED displays with row and column driver PCBs.
3. LED displays with inbuilt intelligence. They are able to communicate directly with the UVMS processor PCB and do not need row and column drivers.

The first two types operate in a very similar manner to their Motorway counterparts.

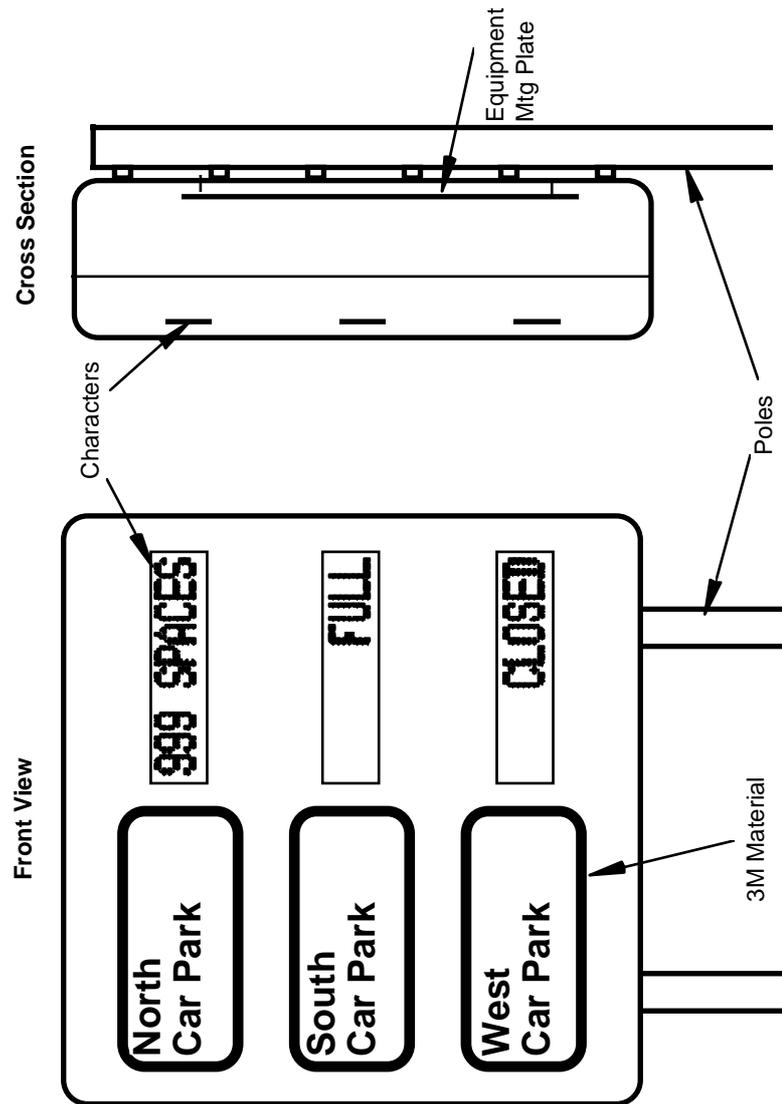


Figure 1 - UVMS Layout

2.1 Control Electronics

The UVMS has a sophisticated electronics module that performs a control and monitoring function on the VMS. This is continually checking the sign for incorrect displays or faults.

In the event of an error being discovered, the electronics initiate fault recovery procedures to ensure a known state exists on the message display.

All the control electronics are mounted on a panel inside the sign. The hardware design of the UVMS is described in detail in Section 3 of this handbook.

2.1.1 Processor

The processor provides the following functionality:

- Communications with the controlling system
- Character driving
- Fluorescent tube switching (flip disc only)
- Heater switching
- Light Sensor Monitoring
- Fault Monitoring

2.1.2 Row and Column Drivers

The Row and Column PCBs route the disc pulses to individual pixels under control of the Processor.

2.1.3 DIN Rail Assemblies

The DIN Rail Assemblies accommodate the following items:

- Mains Input Switch
- Residual Current Device
- Sign Isolation Switch
- Pulse Switcher

The pulse switcher provides disc switching current signal for the flip disc and non-intelligent LED display signs.

On intelligent LED signs a second DIN Rail Assembly accommodates a module to control the relay that supplies power to the character PCBs and, if lanterns are fitted, a module for each lantern that provides power switching and dimming control.

The assembly is protected by a cover.

2.1.4 Battery Backup and Control PCB

In some intelligent LED signs a battery backup system is used to allow mains failure to be signalled before the sign shuts down in the event of mains failure.

Where this system is fitted, the character power relay control circuit is incorporated on this PCB rather than a DIN rail module.

2.1.5 Fluorescent Tube Drivers (Flip Disc only)

Fluorescent tube driving components make up a large proportion of the panel. Each fluorescent tube requires a ballast, a starter and a capacitor. The size of the capacitor and ballast depend on the wattage of the tube being driven.

2.1.6 Mounting Panel

The set of diagrams attached in Appendix C show the general panel layouts for the various sign types, with individual units identified. The smaller panel omits a Row PCB, a Column PCB and 5 ballasts, starters and capacitors (flip disc).

3. SYSTEM HARDWARE

The hardware of the UVMS is divided into the following parts:

Display	Methods used to display the message
Control	Methods used to control and monitor the UVMS
Mechanical	Housing and mounting of the UVMS

3.1 Display Technology

3.1.1 Flip Disc

A message is displayed on the UVMS using an array of 7 x 5 dot matrix characters. These can be used to display textual or graphic symbols.

A UVMS is made up from distinct characters to display textual messages.

The sign utilises a flip disc manufactured by Ferranti-Packard in Canada. These flip discs are grouped in a 7 x 5 matrix to make up one character. They are capable of producing a full range of alphanumeric characters.

Discs can individually be selected on a row and column basis and are set on or off by interaction between permanent magnets and closely coupled electromagnetic coils.

Control signals set the direction of current pulses through the coils, which establishes the direction of the magnetic field in the coils. The permanent magnet in the disc assembly is either attracted or repelled by the field produced in the coil. The 'flip disc' is magnetically latched in the position to which it was last turned until the coil field is reversed by another current pulse.

FLIP - DISC

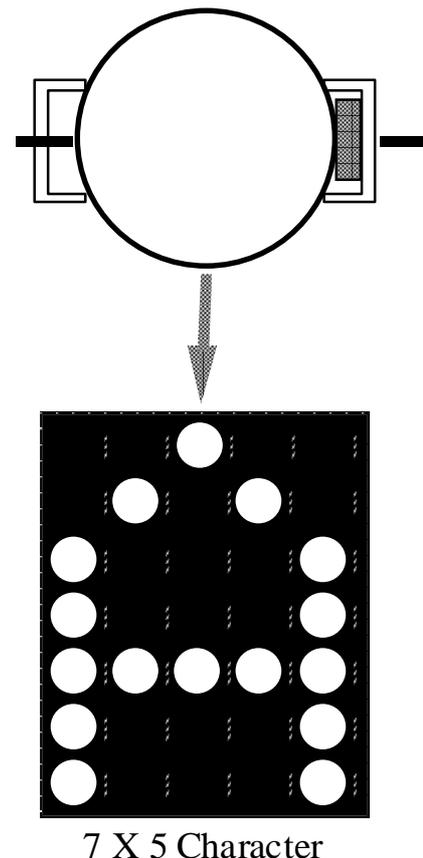


Figure 2 - Flip Disc Character

Power for the flip discs is only required to change the information on the display. The inherent magnetic memory in the 'flip disc' magnetic circuit allows the display to be retained indefinitely without any need for power to the coils.

Each disc rotates freely on a pivot which provides trouble free operation of each pixel.

3.1.2 LEDs

3.1.2.1 Non-Intelligent Displays

Apart from the fact that LEDs replace the flip discs, these displays and their control are very similar to the flip discs described in section 3.1.1 above.

3.1.2.2 Intelligent Displays

The only display element is an LED. The intelligent displays differ from non-intelligent displays described in section 3.1.2.1 above in that the display PCB has a micro on board which carries out the function of the row and column drivers. Consequently, the wiring between the processor PCB and the display PCB is much simplified, needing only 2-wire RS485 to carry out communications.

3.2 Display Lanterns

The UVMS has an option of using lanterns to draw attention to the current message being displayed. Where these are required, the amber coloured lanterns are mounted in the corners of the UVMS.

The lanterns use lamps mounted inside the enclosure.

3.3 Control

All the functions of the sign are controlled from the electronics panel(s) that is mounted inside the sign behind the display characters.

The number and types of PCBs required depend on the type of sign as shown below:

Display type	Processor	Row Driver	Column Driver
Flip Disc	Yes	Yes	Yes
Non-intelligent LED	Yes	Yes	Yes
Intelligent character	Yes	No	No

3.3.1 Processor PCB

The microcontroller used is selected from the Intel 80c188 range and its associated peripheral devices. The device operates using a 32MHz crystal with a processor clock speed of 16MHz.

The Processor PCB has 256k EPROM, 128k RAM, 4 Serial Channels, 6 16bit Timers, 108 I/O Lines, 8 Analogue Input Channels and a Real Time Clock.

The Analogue inputs have a range of 0 to 5V with 10-bit precision. They are used to monitor the current flowing in the LEDs and lanterns and the ambient light sensors.

The EPROM memory is split into 128k for system programs and 128k for character and aspect sets and configuration.

3.3.2 Row and Column Driver PCBs

This PCB provides the interface between the character modules, processor PCB and power supply distribution. It can be used as either a horizontal (row) switch or a vertical (column) switch that set up a path to intersect on a pixel within the character matrix. A current pulse, generated by the Power Supply Distribution PCB, is fed along this path to change the state of the flip disc's magnetic core.

3.4 Mechanical

Two basic enclosure styles have been used. A multiple pole mounting “clam-shell” arrangement and a single cantilever pole mounting with opening rear doors. These are shown below:

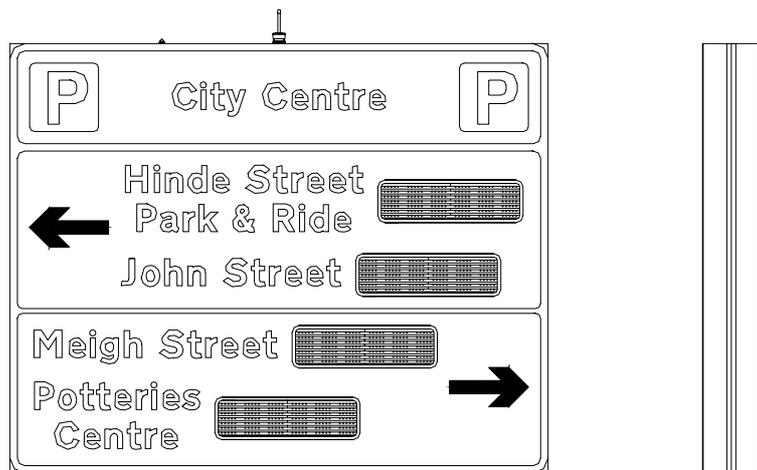


Figure 3 - “Clam-Shell” Enclosure

Clam-shell enclosure allows access to the internal equipment/electronics as suggested in the description; the sign pivots at the top and opens in a controlled manner by utilising gas struts. The gas struts have a locking mechanism to lock the sign in its open position.

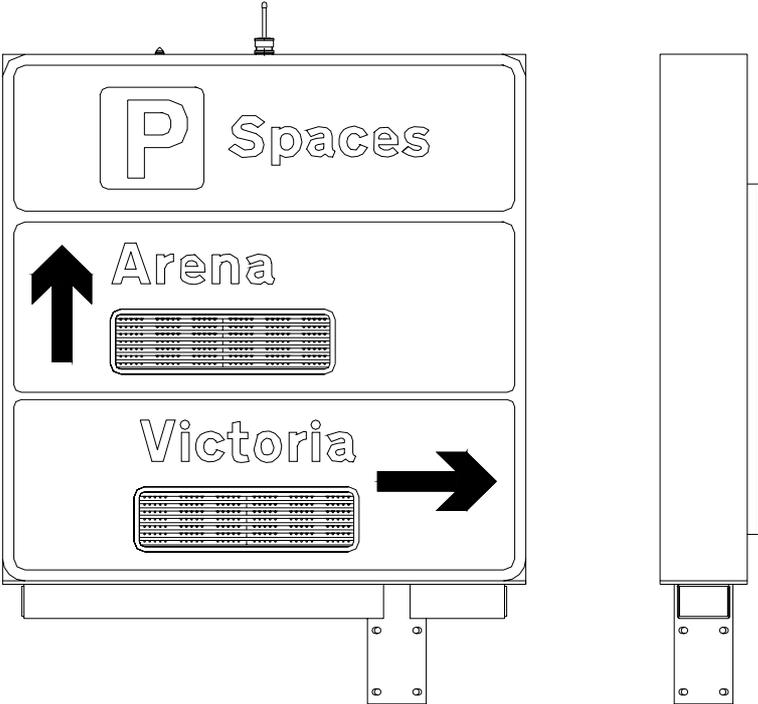


Figure 4 - Cantilever Pole Mounting

4. SYSTEM FACILITIES

4.1 General

The UVMS system offers a variety of facilities to the user. These are listed below and detailed later in this section:

- Customisation of the display face
- Multiple communications interfaces
- Reliable flip disc or LED display technology
- Sign size configurable in manufacture to many different applications
- Comprehensive monitoring of the operation of the sign
- Comprehensive Microsoft Windows based diagnostic facility (with PC)
- Different character sizes available in manufacture for all applications
- Configuration stored in EPROM
- Modular mechanical construction (“Clam-shell” enclosure)
- Mechanical design allows easy replacement of any faulty modules
- Optically tested to DoT Specification TR2136
- EMC tested to DoT Specification TRG1068
- Environmentally tested to DoT Specification TR2130B

4.2 Communications

The UVMS has four serial channels used for communication with other devices. The hardware interfaces for the channels are as follows:

- Serial Channel 1 RS485 isolated to the requirements of BS6301
- Serial Channel 2 RS232 with modem control lines
- Serial Channel 3 RS232 with RTS/CTS only
- Serial Channel 4 RS485 Non-Isolated

4.2.1 Serial Channel 1

- RS485 Differential Data Transmission
- Isolated to meet the requirements of BS6301
- Used for communicating from Instation

4.2.2 Serial Channel 2

- RS232 Data Transmission Interface
- Complete with Modem Control Signals
- Used for communicating from Instation

4.2.3 Serial Channel 3

- RS232 Data Transmission Interface
- Data Signals only
- Used for Diagnostics Terminal

4.2.4 Serial Channel 4

- RS485 Differential Data Transmission Interface
- 2 or 4 wire Data Transmission
- Used to communicate with display PCBs in Intelligent Character signs.

4.3 Diagnostic Facilities

The UVMS provides comprehensive diagnostic facilities in line with the extensive monitoring carried out on all aspects of the operation of the sign. This information is available to the user in two distinct ways:

1. Diagnostic LEDs on the PCBs in the electronics module
2. A comprehensive Microsoft Windows based Diagnostic facility that runs on an IBM compatible PC.

4.3.1 Diagnostic LEDs

Diagnostic LEDs are provided on all PCBs in the electronics module to indicate the presence of the correct power supply to each PCB.

In addition, the Processor PCB has Diagnostic LEDs to indicate the following:

- Communications on Serial Channel 1
- Communications on Serial Channel 2
- Communications on Serial Channel 3
- Communications on Serial Channel 4
- Watchdog Status
- "Run" status - Indicates correct operation of software

4.3.2 Diagnostic Interface

The Diagnostic Interface uses a Serial Communication Channel on the Processor PCB to communicate with a PC.

After the PC is connected and powered up, it presents the maintenance engineer with a series of menus using the Microsoft Windows Operating system. These allow the engineer to interrogate the UVMS on its current operational status and extract the fault log.

The fault log provides a record of any faults that are detected by the control electronics during normal operation of the sign. This fault log is stored in battery backed RAM and each entry in the fault log is time and date stamped by the Real Time Clock of the UVMS.

During a power fail situation, the same Lithium battery used for maintaining the fault log maintains the Real Time Clock.

The facility is also available to set messages on the display for test purposes. This facility is password protected and requires acknowledgement of a warning before a display can be set.

4.4 Display

The design of the UVMS is such that several options are available for configuring the display. As the sign is based upon 7 x 5 dot matrix type characters, virtually any message or graphic can be displayed. The size of the sign is variable up to set limits (See section 4.4.1) and is always implemented using the standard system hardware.

4.4.1 Sign Size

4.4.1.1 Flip Disc and Non-Intelligent Character LED

The size of the UVMS is configurable in manufacture to the application. Each pixel of the display is addressed by selecting the corresponding row and column to set up a path to the pixel. Therefore the theoretical limit to the size of the sign is the number of rows and columns which the Processor PCB is able to address.

The Processor PCB is able to address 8 Row Driver and 8 Column Driver PCBs. The Row Driver PCB can drive four rows of 7 pixels and the Column Driver PCB can drive 6 columns of 5 pixels.

This gives a maximum sign size of 32 rows of 48 characters.

4.4.1.2 Intelligent Character LED Display

As the processor communicates with these display PCBs directly over an RS485 link the number of PCBs is limited only by the electrical limitations of the RS485 link.

This allows for up to 256 displays arranged in any combination of rows and columns.

4.4.2 Display Lanterns

The option exists to fit display lanterns to the corners of a UVMS. These can be used to draw attention to the current message being displayed.

4.4.3 Anti-Condensation Heaters

The characters are mounted in the UVMS behind a clear protective screen. To prevent condensation forming on the inside face of this screen, internal self-regulating heating elements are used.

4.5 Monitoring

Extensive monitoring is carried out at all times on the UVMS to ensure correct operation of all the functions of the sign.

The sign electronics monitors the operation of the sign to determine if any of the faults listed below have occurred.

- Lantern Fault
- Sign Power Supply Fault
- Lamp Failure
- Matrix Fault
- Watchdog Reset Detected
- Internal Communications Fault
- Mains Failure Fault

In the event of a fault occurring, an entry is made into the fault log that is time and date stamped using the Real Time Clock of the UVMS.

4.6 Configuration of UVMS

The UVMS has a configuration EPROM that is located on the processor PCB. This is used to store pre-set variables for each particular UVMS installation. These variables are set during the manufacture of the UVMS.

It has the facility to store the following:

- 48 stored messages (maximum size of 6 rows by 40 columns of characters)
- 252 different characters for display
- The size of sign
- The intensity levels which can be displayed on the sign, in response to the light sensors
- The sample period of the ambient light sensors on the sign
- The lantern flash rate for the amber lanterns
- The Pulse Width Modulation rate for the lanterns and LEDs on the sign.

4.7 Mechanical Facilities

Both types of enclosure allow access to all components in the sign without the need to remove any other component.

The display PCBs are mounted on the front panel and, in the case of the intelligent characters, on power rails that run across the front face.

The majority of the remaining components are located on electronics panel(s). These are mounted on the rear wall of the “clam-shell” enclosures and between character rows on the front panel in the cantilever enclosure. The clam-shell sign opens in a controlled manner by pivoting at the top and utilising gas struts to open in a controlled manner. The gas struts have a locking mechanism to lock the sign in its open position.

(a) Electronics

Estimated as being equivalent to 1.5A at 5V continuous or 7.5W. Allowing for 75% efficient power supply gives 10W at 250V AC.

(b) Heaters

After a short term surge at switch-on, the heaters run at about 60mA/m directly from the 250V mains (i.e. 15W/m).

In the UVMS the heaters are self-regulating and run full time

The length of heater tape and power consumption of the UVMS sign is:

9m – 135W

(c) Lanterns and LEDs

Lanterns

Each lantern is 50W at 12V, allowing 75% efficient supply gives 67W at 250V AC. As two lanterns are on at any given time this equates to 134W.

LEDs

The average number of LEDs illuminated when a character is activated is 15. The standard LED signs have their LEDs powered from 24V and each pixel passes 20mA. This equates to 9.6W per character at 250V allowing for 75% power supply efficiency.

For the intelligent character signs the power is derived from a 5V power supply at 28mA per pixel. This gives 2.8W per character at 250V.

These figures can be used to calculate power consumption for a particular sign usage, and an example is shown below:

Example

An intelligent character sign showing “NO REPORTED INCIDENTS” for 10 hours, “ACCIDENT ON A31 DELAYS EXPECTED” for 2 hours and blank for the remaining 12 hours.

Electronics	24 hours at 10W	= 0.24kWh
Heaters	24 hours at 135W	= 3.24 kWh
1 st message (19 characters, no lanterns)	10 hours at 19 x 2.8W	= 0.53 kWh
2 nd message (27 characters and lanterns)	2 hours at 27 x 2.8W + 134W	= 0.42 kWh
Total power usage for 24 hours		= 4.43 kWh

4.8.4 Optical Requirements

The sign meets the requirements of the DoT Specification TR2136 and European Specification TCC226 for optical performance, measured to the CIE 1931 Chromaticity Chart.

4.8.5 Environmental Requirements

The UVMS meets the requirements of the DoT Specification TR2130B as detailed below:

- a) Dry Heat - Test to 60°C
- b) Cold - Test to -15°C
- c) Damp Heat
- d) Water Penetration - equivalent to IP56
- e) Bump (Packaged)
- f) Vibration (Unpackaged)
- g) Drop (Packaged)

An independent NAMAS approved test house carried out all of these tests.

4.8.6 EMC Requirements

The UVMS meets the requirements of the relevant sections of DoT Specification TRG1068.

The EMC testing was carried out on the UVMS by an independent NAMAS approved test house.

5. INSTALLATION – FLIP DISC AND NON-INTELLIGENT LED DISPLAY UVMS

Warning: Do not wipe the front screen as this will scratch the surface, which will affect the sign’s optical performance.

5.1 Safety Instructions

The assembled units are supplied in a wooden packaging frame.

Lifting of the assembly must only be carried out using the lifting eyes fitted to the sign.

5.2 Installation Process

Refer to the Installation Method Statement (See section 1.3).

The fluorescent tubes are supplied separately to avoid damage. They should only be fitted when the sign has been installed.

6. COMMISSIONING – FLIP DISC AND NON-INTELLIGENT LED DISPLAY UVMS

6.1 Safety Precautions

See section 1.5 for details of safety precautions to be taken when working on the Sign and its associated electronics.

6.2 Pre-Commissioning Checks

This section first describes the function of each UVMS PCB LED and switch and describes which should be set in each situation. The sign contains at least one of each PCB.

6.2.1 Processor PCB LEDs

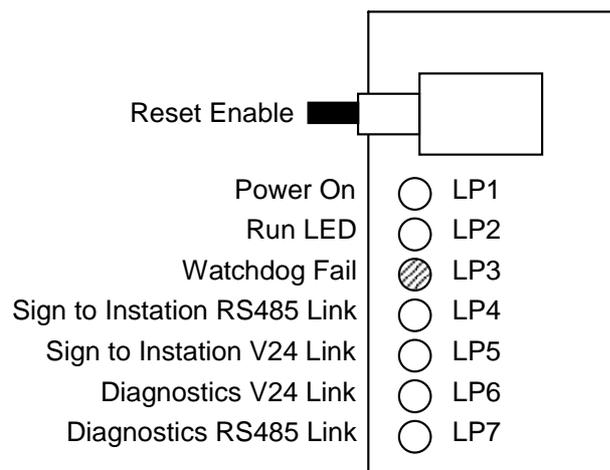


Figure 5 - Flip Disc UVMS Processor PCB LEDs

- "POWER ON" LED indicates that both the logic 5V **and** PCB 12V are present on the processor PCB.
- "RUN" LED pulses when the processor has successfully initialised.
- "WATCHDOG FAIL" LED is lit if the software fails to trigger the watchdog circuit.
- The link LEDs pulse when data is being transmitted by the PCB onto the link.

6.2.2 Processor PCB Switches

The processor PCB has a bank of DIL switches labelled S2, S3 and S4 on the PCB's silkscreen.

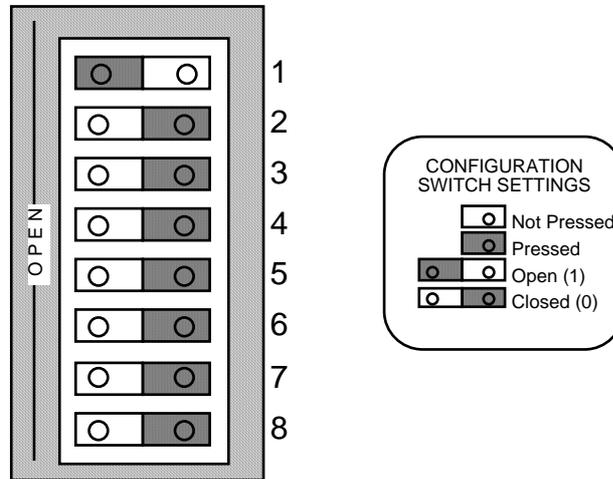


Figure 6 - Flip Disc UVMS Processor PCB Switches

- Address switches (S2) define the address the sign will respond to:
 - No two signs on the same link may have the same address.
 - Switch 1 is the least significant bit.
 - Switch 8 is the most significant bit.
 - Address 00 Hex is invalid. (all switches closed)
 - Address FF Hex is invalid. (all switches open)

Address Switch		
S2	1	LSB
	2	
	3	1=open
	4	0=closed
	5	
	6	
	7	
	8	MSB

- The Luminance level switches (S3) set the threshold at which the fluorescent tubes are switched on. The ambient light level sensor determines the luminance level. Level 1 corresponds to low light levels and level 4 to high light levels. The threshold between level 3 and 4 is nominally 400 lux. Two switches for each of the levels determine if the fluorescent tube is switched on or off. The switch settings for level 4 are different from levels 1 to 3.

For UVMS always set the luminance switch S3 to all 8 bits being closed.

Note: The diagnostic terminal can be used to determine which luminance level the sign is operating in by selecting the Monitor Light Sensors option (See Appendix A4.4.4).

Luminance Switch		
S3	1	LSB \ Level 1
	2	MSB /
	3	LSB \ Level 2
	4	MSB / 1=open
	5	LSB \ Level 3 2=closed
	6	MSB /
	7	LSB \ Level 4
	8	MSB /

MSB	LSB	Luminance Level 1 to 3 switch settings
0	0	Tubes On
0	1	Tubes On
1	0	Tubes Off
1	1	Tubes Off

MSB	LSB	Luminance Level 4 switch settings
0	0	Tubes Off
0	1	Tubes Off
1	0	Tubes On
1	1	Tubes On

- Mode switches (S4) set the mode in which the sign is initialised:

Mode Switch		
S4	1	Closed - Diagnostics on RS485 Open - Diagnostics on RS232
	2	Closed - Instation link on V24 Open -Instation link on RS485
	3	Closed - Sign is an EMS Open - Sign is an EMI This switch must be CLOSED
	4	Closed - Luminance Override is OFF Open - Luminance Override is ON
	5 - 8	Sets EMI Type - Not Used for UVMS Set to all OPEN.

- Reset Enable and Reset switches reset the sign when pressed simultaneously.

6.2.3 Row / Column Driver PCB LEDs and Switches

LEDs:

- "POWER LED" indicates the presence of logic 5V on the driver PCB.

Switches:

- Address switch (S1) is a 16 position rotary switch and should be set to 0 for signs with only one of each driver PCB (24 characters or less). If more than one of that particular type of driver PCB is fitted to the sign then the switches must be set sequentially from 0.

6.3 Test Equipment

- Multi-meter (Fluke 77 or similar)
- Insulation Tester (16D251B or similar)
- Earth Loop Impedance Tester (Meggar LT5 or similar)
- RCD Tester (Seaward RC500 or similar)

6.4 Installation Testing

- Continuity and Insulation (cables)
- Visual Inspection
- Earth Testing of Installation
- Inspection Certificate
- Installation Test Report
- Insulation Test
- Earth Loop Impedance Test
- RCD Test

The functional test method for the installation varies for each site and should be specified in the contract. It is not covered here.

The checklist in Appendix B should be completed.

6.5 Electrical Strength Tests

A record of the results of the tests detailed in this section should be made on the checklist in Appendix B.

6.5.1 Insulation Test

Preparation

This test is to be carried out prior to connecting mains power to the sign.

Remove the Switch Cover from the mains components.

Ensure the Mains Isolation Switch and the RCD are switched on and that Fuse 1 (labelled on the mains distribution block) is in place.

Test

With the Megger test instrument (set to 500V operation) carry out the following tests:

- Connect between the main ground stud and the Mains in Live terminal on the Mains Isolation Switch.

Test insulation impedance. It must be greater than 1 megohm.

- Connect between the main ground stud and the Mains in Neutral terminal on the Mains Isolation Switch.

Test insulation impedance. It must be greater than 1 megohm.

6.5.2 Earth Loop Impedance Test

Preparation

After ensuring that the cable is not live connect Mains to the signs distribution box.

The sign should be switched on and operating normally unless otherwise stated in the following subsections.

SAFETY

During the test ensure that NO person is in contact with any part of the sign, its cabinet or the mounting pole.

Tests

Using an LT5 tester: Connect the Red probe to the Live input at the Mains Isolation Switch and the earth test probe of the tester (Black probe) to the following points in turn and carry out an Earth Loop Impedance Test for each point:

- (a) Main Earth
- (b) The earth pin of the maintenance socket
- (c) The door lock assembly of each access door
- (d) The Electronics Panel
- (e) The mounting pole
- (f) The sign to pole interface mounting plate

Maximum Allowable Impedance (RCD protected)

The maximum allowable earth loop impedance of an electrical installation following an in-line RCD is calculated by using the formula:

$$Z = \frac{50 \times 1000}{I \text{ (mA)}}$$

Where I (mA) is the operating current, in milliamps, for the RCD (i.e. In this case with a 30mA RCD Z can be up to 1666 ohms).

6.5.3 Prospective Short Circuit Current

Repeat the above test between the live and neutral conductors of the incoming supply, (ZL-N). The prospective short circuit current at the origin can be calculated from this reading using the following formula:

$$\text{Prospective short circuit current} = \frac{230\text{V}}{Z_{L-N} \text{ at origin}}$$

If this value exceeds 16000 amps refer to Engineering. (In practice, if the LT5 records a value of less than 0.02Ω.)

6.5.4 VMS RCD Tests

This test is performed with the RC500 or similar meter. The test measures the actual disconnection time of the RCD.

- (a) Ensure all mains distribution switches are switched off. Ensure all connections to power supplies, PCBs etc. are correctly made.
- (b) Switch on the Master switch.
- (c) Ensure the Maintenance Socket RCD is switched off. Plug the RCD tester into the Maintenance Socket.
Switch on the Maintenance Socket RCD.
Check that the polarity indicators on the RCD tester are correct.
Set the trip current on the tester to 30mA.
Press the button on the tester and check that the tester indicates that the RCD has tripped within 200ms.
- (d) Reset the maintenance socket RCD.
Set the trip current on the tester to 150mA.
Press the button on the tester and check that the tester indicates that the RCD has tripped within 40ms.
- (e) Switch off the master switch, disconnect the tester from the controller and reset the Maintenance Socket RCD.

7. MAINTENANCE – FLIP DISC AND NON-INTELLIGENT LED DISPLAY UVMS

7.1 Safety Precautions

See section 1.5 for details of safety precautions to be taken when working on the Sign and its associated electronics.

7.2 Routine Maintenance Procedure

The timetable below is the recommended maintenance interval. The actual timetable must be agreed with the regional maintenance controller.

7.2.1 Annual

- In areas of high pollution and dirty conditions the period between cleaning may have to be reviewed depending on site conditions. Clean using a jet of water only.

Warning: Do not wipe the front screen as this will scratch the surface, which will affect the sign's optical performance.

- Signs should be visually checked to ensure that all LEDs on the sign are working correctly. Exercise all pixels on the sign by using the EMS Set Message function of the diagnostic terminal. See Appendix A4.3.3.1.
- Visually inspect for any paint work damage. Repair as required.
- Check the operation of the gas struts on clam-shell signs. Operate/cycle pivoting portion of the sign to lubricate the gas struts.
- Check the operation of the gas strut locking mechanism.
- Replace defective gas struts as necessary.
- Re-tighten all fixing screws and nuts as required.
- Check and grease the locks.
- Check the sealing strips for wear. Repair as required.

- Check the sign for water ingress where this may affect operation.
Repair as required.
- Check the water drainage vents.
Clean as required.
- Remove, clean and replace air filters (if fitted).
- Check incoming mains cable connector for wear.
- Check the condition of the PCBs (i.e. scorching, corrosion etc.), batteries and fuses. Replace as necessary.
Note: When replacing a battery, the battery label must also be replaced or updated.
- Examine the diagnostic current fault log.
Note and rectify any faults reported.
- Check that the outputs of the power supplies are within the following limits:

12v	+/-0.6v
5v	+/-0.25v

If either of these is outside the limits then the power supply should be changed.
- Replace fluorescent tubes (where fitted).

7.3 Fault Finding

On arrival at site the first action is to examine the "Diagnostic Current Fault Log" (See Appendix A4.4.3 for details). Any faults found here should be cleared by the appropriate action. Where communications between the sign and the diagnostic terminal cannot be established or the fault cannot be cleared simply, refer to the following tables.

7.3.1 Sign

Symptom	Diagnosis	Action
Sign not talking to Central Office	Incorrect address set at Sign	Set correct address on processor board
	RS485/232 Switch in the incorrect position (switch 4 switch 2).	Set switch to correct position.
	Fault in line between sign and central office.	Find and repair fault.
Sign will not set but will communicate with Central Office.	EMS/EMI switch in the incorrect position (switch 4 switch 3).	Set switch to correct position.
Sign Run LED not flashing and watchdog LED is ON.	EPROMs may be fitted incorrectly.	Check EPROMs.
	Processor PCB faulty.	Replace Processor PCB
Sign Run LED not flashing but watchdog LED is OFF.	Address switch set to 00H or FFH	Set correct address.

7.3.2 Sign Characters

Symptom	Diagnosis	Action
Discs do not flip positively and rest in half flipped position.	Ribbon connectors on rear of characters are not pushed home.	Push connectors home.
	Ribbon connectors on row / column driver PCBs are not pushed home.	Push connectors home.
	Ribbon connectors on rear of characters incorrectly aligned.	Reconnect connector.
Disc(s) on one character do not flip at all.	Fault on character PCB.	Replace character.
Discs on a group of characters do not flip at all.	Fault on character PCB.	Disconnect one of the faulty characters at a time & test. If symptom disappears, replace disconnected character.
	Fault on Driver PCB.	Replace relevant driver PCB(s).

7.3.3 Fluorescent Tubes

Symptom	Diagnosis	Action
Fluorescent tube flickering.	Faulty starter.	Replace starter.
Fluorescent tube off when others are lit.	Faulty tube.	Replace tube.

7.3.4 Power

Symptom	Diagnosis	Action
PCB 12V LED is OFF.	Fuse blown and no short on power supply / wiring.	Replace fuse FS3.
	Fuse blown and short on power supply / wiring.	Replace fuse FS3. Replace power supply / wiring
Logic 5V LED is OFF.	Fuse blown and no short on power supply / wiring.	Replace fuse FS4
	Fuse blown and short on power supply / wiring.	Replace fuse FS4. Replace power supply / wiring

7.4 Replacement of Component Parts

Before replacement of any components takes place, the sign should be completely switched off and isolated from the mains supply. The mains isolation should be made external to the sign enclosure, prior to working on / replacing components inside the sign enclosure.

7.4.1 Replacement of PCBs

In the event of a PCB requiring replacement it must be replaced by a part of the same type and the same or higher issue state. Before removing the PCB note all switch settings and configure the replacement PCB in a similar manner. Swap the EPROMs and PLD on the faulty PCB with those from the replacement PCB. In order to replace a PCB, all the connections to that PCB should be removed. The PCB can then be removed from the panel. This is achieved by removing the retaining clips (or screws) at each corner.

When handling PCBs or electronic components, all reasonable precautions must be taking to prevent the damage of components by ESD.

7.4.2 Replacement of Power Supply

The Power Supply Unit is mounted on the metal panel adjacent to the processor PCB. After ensuring that the mains supply is completely isolated the procedure for replacement is as follows:

- Remove ELV connections from the power supply
- Remove LV (mains voltage) connections from the power supply

The power supply can now be unscrewed from the panel. Fit the replacement unit and reconnect the wiring,

7.4.3 Replacement of items on the DIN Rail Assembly

Warning: Before removing any protective covers on the DIN rail assembly, ensure that the mains supply to the sign is isolated externally to the sign enclosure.

The protective cover must first be removed to gain access to the DIN rail mounted components. Remove and replace any required items.

7.4.4 Replacement of miscellaneous panel mounted items

All units on the mounting panel are fastened using studs/nuts/washer or rivnuts. In order to remove any item, the necessary fixing must first be unfastened.

Capacitors for the fluorescent tubes can be simply unclipped once the wiring has been disconnected. Fluorescent tube starters plug into holders and require no wiring to be disconnected.

Any item that is removed should be replaced by an identical item, identified by its STCL Part No.

7.4.5 Replacement of Characters

The character modules are clipped into rectangular cut-outs in the front panel mounting plate. To replace a module, follow the procedure below:

- Remove Row and Column Cables (Ribbon Cables) See Note 1.
- Release the character retaining clips (or screws)
- Ease the character out from the front panel.

Ensure that the any replacement characters are free from dirt or any contamination that may prevent the discs rotating.

The character can now be replaced. The procedure for replacing the character into the sign is the reverse of the removal procedure.

Note 1: Use a rocking motion to reduce strain on the cable. When replacing ensure they are pushed fully home.

7.4.6 Replacement of Heaters

The heater element is located at the lower edge of the display window. The heater is removed by releasing it from its retaining clips. The supply cable to the heater must then be disconnected to complete removal of the heater element.

The new heater element can then be installed and connected to the heater power supply.

When this is complete use the diagnostics heater test function to check satisfactory operation. The character units can then be replaced.

7.4.7 Replacement of Light Sensor

The light sensor is mounted at the top of the sign enclosure. To replace a light sensor perform the following steps:

- Disconnect the red and white wires to the light sensor
- Unscrew the light sensor nut
- Remove the light sensor.

Ensure that any sealing rings are intact. The light sensor can now be replaced. The procedure for replacing the light sensor into the sign is the reverse of the removal procedure.

Once the faulty light sensor has been replaced it should be checked for correct working as follows:

- Connect the Diagnostic Terminal
- Display the 'Monitor Light Sensors screen' and check that the replaced light sensor is giving sensible readings (40 to 1000).
- Display the 'Complete Fault Log' and check that an entry has been placed in the fault log showing clearance of the light sensor failure.
- Cover up the light sensor so that the readings are very low.
- Display the 'Monitor Light Sensors screen' again and check that the light sensor is giving very low readings (less than 40).
- Uncover the light sensor.

For firmware issue 6:

Display the 'Complete Fault Log' and check that an entry has been placed in the log that the light sensor variation failure has cleared.

For firmware issue 5:

Display the 'Complete Fault Log' and check when the light sensor variation failure was detected. This check is performed approximately every 24 hours, so

note when the failure should be cleared. After that time, either return to the sign and check the fault log, or check that the light sensor failure bit is not set when the instation requests the status of the sign.

7.4.8 Replacement of Fluorescent Tube

The fluorescent tubes can be accessed without removing any other items. To remove simply unclip from the fittings and disconnect the mains connectors.

Care must be taken when handling these tubes, do not manhandle or expose to severe shock.

7.4.9 Replacement of gas struts

Open the sign to its full extent and secure/clamp in its open position. Ensure that the clamping mechanism used prevents the sign closing when the gas struts are removed. Remove the gas strut securing screw and fit the new gas strut. Ensure that the locking mechanism on the new gas strut operates correctly and can hold the sign open. Remove the clamping mechanism and adjust the gas strut resistance to the require setting to hold the sign open but also allow the sign to be closed.

7.5 Repainting

Observe all the Safety Precautions regarding the use, storage and disposal of the paint products described in the following sections.

7.5.1 Repainting of Sign

The sign casing should have its paint finish repaired as soon as it starts to show signs of deterioration, e.g. small scratches, chips, abrasions, etc. It is not necessary to recoat the entire sign, but retouch only those areas which have been damaged.

The touch in paint has two components; powder paint and ethyl methyl ketone (EMK) solvent. It must be mixed in the ratio 2 parts powder to 1 part solvent by volume using the spatula and plastic container supplied. See the Safety Precautions below. Apply in small quantities only where absolutely necessary using a fine pointed brush and avoid covering the surrounding areas.

The paint is touch dry in approximately 15 minutes at 20°C, requiring longer at lower temperatures.

The solution should be applied within half an hour of mixing, otherwise it becomes thick and unusable. If this occurs, the made-up paint may be thinned by addition of small quantities of EMK. The mixed paint may be stored for up to one week in a suitably sized closed container. After this time any unused mixed paint must be disposed of. Do not thin down the solution with more EMK solvent.

Surplus paint should be cleaned off the existing paintwork using a weak industrial solvent, e.g. Inhibisol. Brushes and equipment may be cleaned using EMK solvent.

If any large areas of damage occur to the paintwork, the product should be returned for re-working.

The shelf life of the powder paint is six months, if stored in cool dry conditions away from bright light. After this period, water vapour from the air permeates the package making the powder lumpy and mixing difficult. EMK Solvent may be stored indefinitely.

Safety Precautions - Solvent

Avoid inhaling EMK vapour and contact with eyes. EMK solvent is highly inflammable and explosive in vapour/air mixtures. Do not drink.

First Aid:	Inhalation	Remove from exposure. Rest and keep warm.
	Eyes	In the event of EMK solvent entering the eyes, flush with copious supplies of cold water and obtain medical advice.
	Skin	Wash thoroughly with soap and water.
	Mouth	Wash with copious supplies of cold water and obtain medical advice. If accidentally swallowed, obtain immediate medical attention. Keep at rest. DO NOT induce vomiting.

Safety Precautions - Powder Coating

The following applies to all products labelled MSDS 3.

The product is classified as Harmful and Irritant.

First Aid:	Inhalation	Remove to fresh air. Rest and keep warm. Give nothing by mouth. If unconscious, place in the recovery position and seek medical advice.
	Eyes	Contact lenses should be removed. Irrigate with copious supplies of clean, fresh water for at least 10 minutes, holding the eyelids apart, and obtain medical advice.
	Skin	Remove contaminated clothing. Wash thoroughly with plenty of water, or use a proprietary skin cleanser. DO NOT use solvent or thinners.
	Mouth	Wash with copious supplies of cold water and obtain medical advice. If accidentally swallowed, obtain immediate medical attention. Keep at rest. DO NOT induce vomiting.

Handling and Storage

Persons with a history of respiratory problems or allergic responses should only be exposed to, or handle this product, under appropriate medical supervision.

Precautions should be taken to prevent the formation of dusts in concentrations above explosive or occupational exposure limits. Electrical equipment and lighting should be protected to appropriate standards and to prevent dust coming into contact with hot surfaces, sparks or other ignition sources.

Keep the container tightly closed. Exclude sources of heat, sparks and open flame. Avoid the inhalation of dusts. Smoking, eating and drinking should be prohibited in all areas of storage and use. Observe the label precautions. Store between 5°C and 25°C in a dry, well ventilated place away from sources of

heat, ignition and direct sunlight. No smoking. Prevent unauthorised access. Opened containers should be properly resealed and kept upright to prevent leakage. The principles contained in the HSE guidance note Storage of Packaged Dangerous Substances should be observed when storing this product.

Fire Fighting Measures

Recommended extinguishing medium - Alcohol resistant foam, CO₂ blanket or water spray/mist.

NOT to be used - High pressure inert gas (e.g. CO₂) or water jets.

Fire will produce dense black smoke containing hazardous products of combustion which may include carbon monoxide, carbon dioxide and oxides of nitrogen. Exposure to decomposition products may be a hazard to health. Appropriate self-contained breathing apparatus may be required. Cool closed containers exposed to fire with water spray. Do not allow run-off from fire fighting to enter drains or water courses.

Disposal Considerations

Do not allow into drains or water courses or dispose of where ground or surface waters may be affected.

Wastes, including emptied containers, are controlled wastes and should be disposed of in accordance with regulations made under the Control of Pollution Act and the Environmental Protection Act. Obtain advice from the Waste Regulation Authority whether special waste regulations apply.

7.6 Spares

7.6.1 Component Parts

The UVMS Signs contain no user serviceable parts except for fuses and fluorescent tubes. In the event of failure the whole faulty item must be replaced with an identical unit. The Siemens part number of each spare part is listed below.

Item	Siemens Part No.
Processor PCB Assembly	667/1/24620/001
Row Driver PCB (small flip disc)	667/1/24622/003
Row Driver PCB (LED)	667/1/24622/005
Column Driver PCB (small flip disc)	667/1/24622/004
Column Driver PCB (LED)	667/1/24622/006
F-P 150 Characters	434/4/91135/000
F-P 100 Characters	434/4/91134/000
Light Sensors	667/7/24680/000
PSU 5V & 12V	667/7/27508/000
Heater	667/2/24690/002
Heater Tape	418/4/39817/000
RS485 Line Protection PCB	667/1/20584/001
Gas Strut (Short)	999/4/44160/000
Gas Strut (Medium)	999/4/44160/000
Gas Strut (Long)	999/4/44194/000

7.6.2 Consumables

Ref	Location	Type	Siemens Part No.
FS1	Din Rail	5A 240V BS1361 HRC	518/4/90638/000
FS2	Din Rail	5A 240V BS1361 HRC	518/4/90638/000
FS3	Panel	2AT 20 x 5mm	518/4/90284/006
FS4	Panel	2AT 20 x 5mm	518/4/90284/006
	Processor PCB	QB 500mA fuse	518/4/90285/004
	Panel	Fluorescent Tube Starter 155/800	517/4/97071/000
	Panel	Fluorescent Tube Starter 155/801	517/4/97071/001
	Sign Face	100W Tube 2400mm long	517/4/97068/020
	Sign Face	85W Tube 1800mm long	517/4/97068/018
	Sign Face	65W Tube 1500mm long	517/4/97068/015
	Sign Face	40W Tube 1200mm long	517/4/97068/012
	Sign Face	40W Tube 600mm long	517/4/97068/007
	Processor PCB	3V Lithium Battery	418/4/97186/000
	Panel	QB 12A 32V fuse	518/4/98006/015

Note: A standard set of fluorescent tubes is listed here; the quantity and type will differ depending on the particular sign configuration. It is recommended that tube spares are selected depending on the signs being maintained.

Warning: Fuses must only be replaced with ones of the correct type and rating. The use of incorrect fuses may irreparably damage the equipment.

8. INSTALLATION – INTELLIGENT CHARACTER UVMS

Warning: Do not wipe the front screen, as this will scratch the surface, which will affect the sign's optical performance.

8.1 Installation Process

Refer to the **Installation** Method Statement (see section 1.3).

9. COMMISSIONING – INTELLIGENT CHARACTER UVMS

9.1 Safety precautions

See section 1.5 for details of safety precautions to be taken when working on the Sign and its associated electronics.

9.2 Pre-commissioning checks

This section first describes the function of each UVMS PCB switch and LED and describes which should be set in each situation.

9.2.1 Processor PCB LEDs

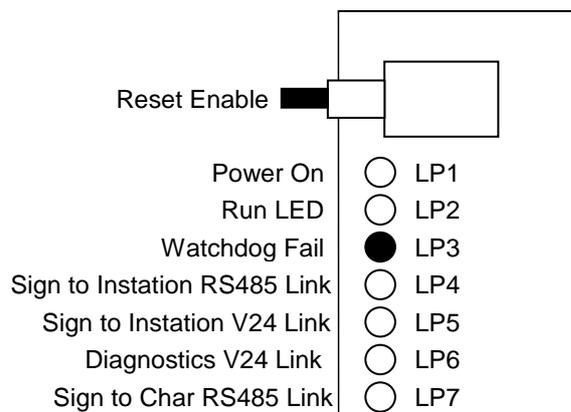


Figure 7 - Intelligent Characters UVMS Processor PCB LEDs

- "POWER ON" LED indicates that both the logic 5V and PCB 12V are present on the processor PCB.
- "RUN" LED pulses when the processor has successfully initialised.
- "WATCHDOG FAIL" LED is lit if the software fails to trigger the watchdog circuit.
- The link LEDs pulse when data is being transmitted by the PCB onto the link.
- LP7 should flash briefly every 5 seconds.

9.2.2 Processor PCB Switches

The processor PCB has a bank of DIL switches labelled S2, S3 and S4 on the PCB's silkscreen.

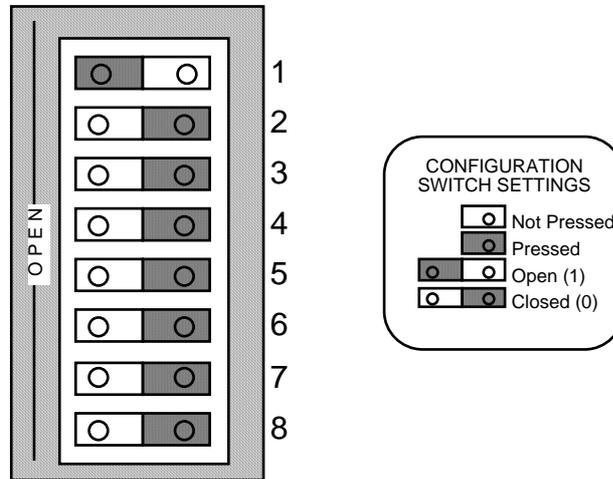


Figure 8 - Intelligent Characters UVMS Processor PCB Switches

- Address switches (S2) define the address the sign will respond to:
 - No two signs on the same link may have the same address.
 - Switch 1 is the least significant bit.
 - Switch 8 is the most significant bit.
 - Address 00 Hex is invalid. (all switches closed)
 - Address FF Hex is invalid. (all switches open)

Address Switch		
S2	1	LSB
	2	
	3	1=open
	4	0=closed
	5	
	6	
	7	
	8	MSB

- Luminance level switches (S3) allow adjustment of the lantern and character LED light outputs. The luminance level is determined by the ambient light level sensors. Level 1 corresponds to low light levels and level 4 to high light levels. For each light level one of four sub levels may be set. The light output for both LEDs and lanterns defined by the sub levels is determined by the configuration EPROM and can be changed.

For UVMS signs always set the luminance switch S3 to all 8 bits being closed.

Note: The diagnostic terminal can be used to determine which luminance level the sign is operating in by selecting the Monitor Light Sensors option (See Appendix A4.4.4).

Luminance Level Switch		
S3	1	\ Level 1
	2	/
	3	\ Level 2 1=open
	4	/ 0=closed
	5	\ Level 3
	6	/
	7	\ Level 4
	8	/

UVMS signs with a Configuration PROM labelled DT999_2xx or DT999_3xx have the luminance levels set to the following:

Band	Switch			
	00	01	10	11
1	4%	20%	48%	100%
2	20%	4%	48%	100%
3	48%	4%	20%	100%
4	100%	4%	20%	48%

1=open

0=closed

UVMS signs with a configuration PROM labelled DT999_4xx have the luminance values set to the following:

Band	Switch			
	00	01	10	11
1	4%	20%	4%	48%
2	20%	20%	20%	48%
3	48%	48%	48%	100%
4	100%	100%	48%	100%

1=open

0=closed

- Mode switches (S4) set the mode in which the sign is initialised:

Mode Switch		
S4	1	Open - Diagnostics on RS232 This switch must be OPEN
	2	Closed - Instation link on V24 Open -Instation link on RS485
	3	Closed - Sign is an EMS Open - Sign is an EMI This switch must be CLOSED
	4	Closed - Luminance Override is OFF Open - Luminance Override is ON
	5 - 8	Sets EMI Type - Not Used for UVMS Set to all CLOSED.

- Reset Enable and Reset switches reset the sign when pressed simultaneously.

9.2.3 Signs Driven from OTU only

Wire between the sign and the OTU as shown in Figure 9.

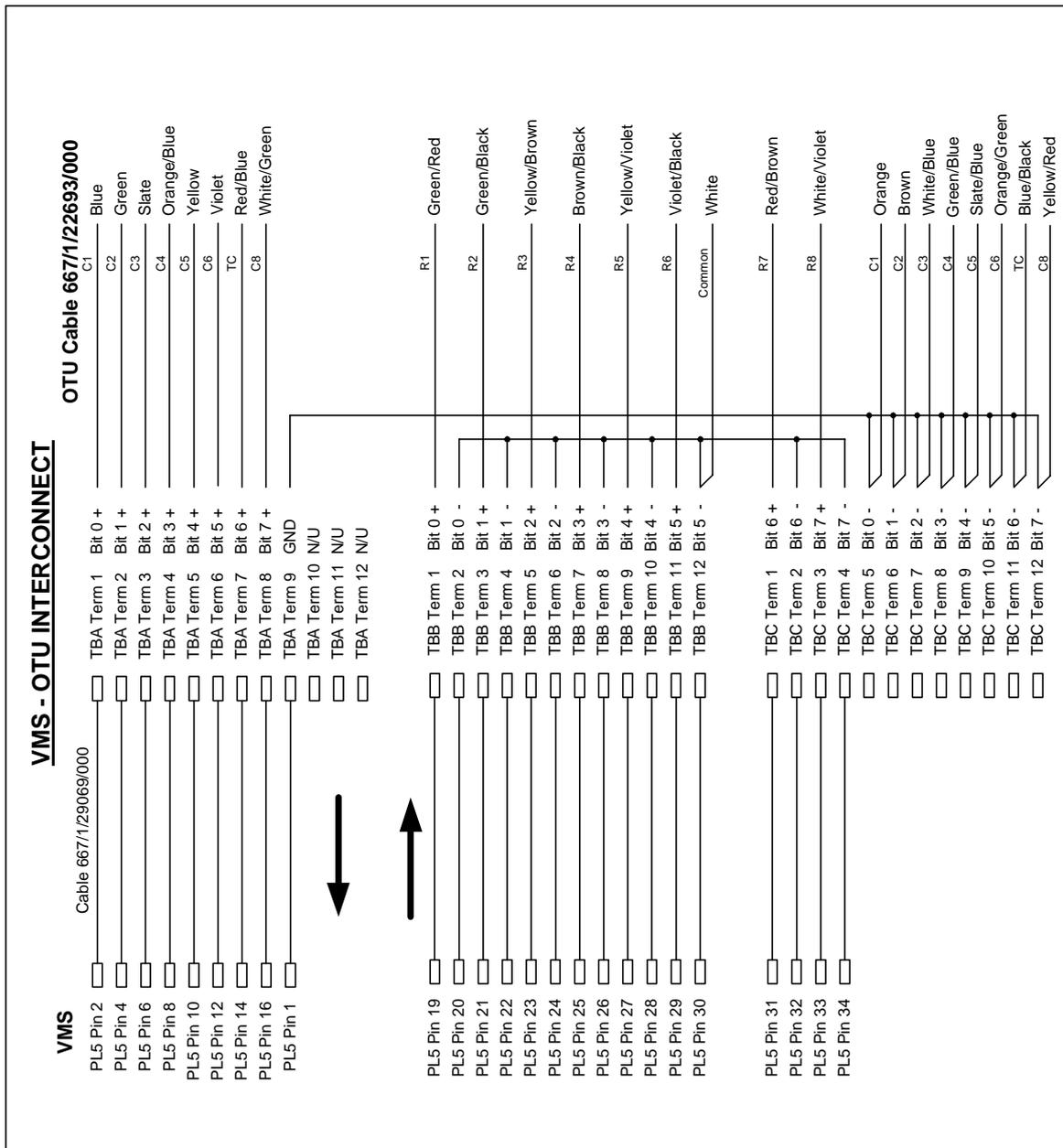


Figure 9 – VMS to OTU Interconnections

9.3 Test Equipment

- a) Multi-meter (Fluke 77 or similar)
- b) Insulation Tester (16D251B or similar)
- c) Earth Loop Impedance Tester (Megger LT5 or similar)
- d) RCD Tester (Seaward RC500 or similar)

9.4 Electrical Strength Tests

A record of the results of the tests detailed in this section should be made on the checklist in Appendix B.

9.4.1 Insulation Test

Preparation

This test is to be carried out prior to connecting mains power to the sign.

Remove the Switch Cover from the mains components.

Ensure the Mains Isolation Switch and the RCD are switched on and that Fuse 1 (labelled on the mains distribution block) is in place.

Test

With the Megger test instrument (set to 500V operation) carry out the following tests:

- Connect between the main ground stud and the Mains in Live terminal on the Mains Isolation Switch.

Test insulation impedance. It must be greater than 1 megohm.

- Connect between the main ground stud and the Mains in Neutral terminal on the Mains Isolation Switch.

Test insulation impedance. It must be greater than 1 megohm.

9.4.2 Earth Loop Impedance Test

Preparation

After ensuring that the cable is not live, connect Mains to the signs distribution box.

The sign should be switched on and operating normally unless otherwise stated in the following subsections.

SAFETY

During the test ensure that NO person is in contact with any part of the sign, its cabinet or the mounting pole.

Tests

Using an LT5 tester: Connect the Red probe to the Live input at the Mains Isolation Switch and the earth test probe of the tester (Black probe) to the

following points in turn and carry out an Earth Loop Impedance Test for each point:

- (a) Main Earth
- (b) The earth pin of the maintenance socket
- (c) The door lock assembly of each access door
- (d) The Electronics Panel
- (e) The mounting pole
- (f) The sign to pole interface mounting plate

Maximum Allowable Impedance (RCD protected)

The maximum allowable earth loop impedance of an electrical installation following an in-line RCD is calculated by using the formula:

$$Z = \frac{50 \times 1000}{I \text{ (mA)}}$$

Where I (mA) is the operating current, in milliamperes, for the RCD (i.e. In this case with a 30mA RCD Z can be up to 1666 ohms).

9.4.3 Prospective Short Circuit Current

Repeat the above test between the live and neutral conductors of the incoming supply, (Z_{L-N}). The prospective short circuit current at the origin can be calculated from this reading using the following formula:

$$\text{Prospective short circuit current} = \frac{230\text{V}}{Z_{L-N} \text{ at origin}}$$

If this value exceeds 16000 amps refer to Engineering. (In practice, if the LT5 records a value of less than 0.02Ω.)

9.4.4 VMS RCD Tests

This test is performed with the RC500 or similar meter. The test measures the actual disconnection time of the RCD.

- (a) Ensure all mains distribution switches are switched off. Ensure all connections to power supplies, PCBs etc. are correctly made.
- (b) Switch on the Master switch.
- (c) Ensure the Maintenance Socket RCD is switched off. Plug the RCD tester into the Maintenance Socket.
Switch on the Maintenance Socket RCD.
Check that the polarity indicators on the RCD tester are correct.
Set the trip current on the tester to 30mA.
Press the button on the tester and check that the tester indicates that the RCD has tripped within 200ms.
- (d) Reset the maintenance socket RCD.
Set the trip current on the tester to 150mA.
Press the button on the tester and check that the tester indicates that the RCD has tripped within 40ms.
- (e) Switch off the master switch, disconnect the tester from the controller and reset the Maintenance Socket RCD.

9.5 Functional Testing

This section details the testing of a complete UVMS to ensure that the equipment is operational following installation.

During the operational tests specified in this section extensive use is made of the Diagnostic Terminal, which is described in Appendix A.

Terminal command options are shown in bold as follows:

Control > RT Clock

Means the **RT clock** option from the **Control** menu.

A password is required before some options can be used. This is defaulted as follows:

SIGN ACCESS

Note: Some functions may ask for a second password. These functions are only for Factory use and are not to be used in Site situations.

9.5.1 Functional system test

- (a) Connect a diagnostic terminal to the sign (Skt. 2 on the processor PCB). Check that the sign is configured for RS232 diagnostics: if the switch is set incorrectly, change it and reset the sign by pressing the RESET ENABLE and RESET switches simultaneously.

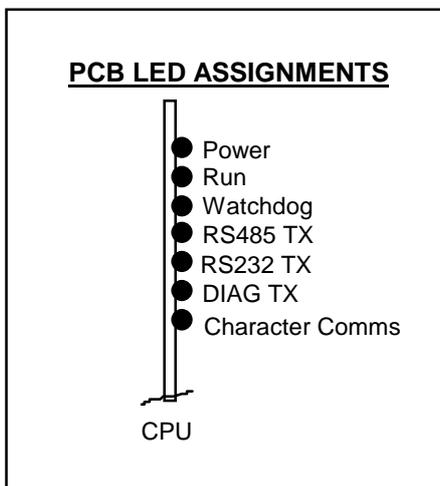
Check that the following LEDs on the CPU PCB are illuminated:

The Power indicator LED

The Run LED (This should flash approximately once a second)

The Character Comms LED illuminates briefly once every five seconds

Check that the watchdog LED on the processor PCB is **not** illuminated.



Use the **Reports > Fault log > Complete Fault Log** to ensure that no unacceptable faults have been detected on power up. See sections 7.3 and 10.3 for a summary of faults that need actions.

- (b) Set the real time clock using the **Control > RT Clock** option of the diagnostic terminal.
- (c) Use the **Control > Settings > Set EMS Message** option of the diagnostic terminal. Switch on the lanterns and set the character sequence "ABCD.....XYZ" on the sign (using just enough characters to fill the sign). N.B. Any extra characters on the initial line will blank out the sign. To enter a new line of characters use CTRL/ ENTER.

Check that the displayed sequence is correct (i.e. all displayed characters are in the correct order).

- (d) Use the **Reports > Monitor Light Sensors** option of the diagnostic terminal to display the status of the light sensors.

Cover the sensors and check that the displayed value for each sensor is less than 3.

Uncover the sensors and check that the displayed value for each sensor is greater than 10.

- (e) Check that the heaters are on and remain on.

- (f) Switch off the master switch to the sign and check that the sign is blanked.

Signs with Battery Backup only -

- (g) Observe that the CPU PCB and Modem remain powered and then power down 25 ± 10 seconds after the removal of mains power.

- (h) Switch the master switch back on and check the processor PCB Run and Watchdog LEDs as in (a) above.

- (i) Set the battery switch (S1) on the processor PCB to ON/

- (j) **Signs with PAKNET only -**

To register the RP9 Radio-Pad, ensure power is connected and then press and hold the Test Button for 3 to 5 seconds. Only release the test button once the yellow service light has started to flash slowly. Registration is now performed automatically, which may require up to one minute. After registering, the service light remains lit if a radio base station can be found and used.

If the service light is lit, a test call can be made to the network by pressing the test button twice within one second. On the second depression, the service light is extinguished for half a second.

A successful test call is shown by the service light remaining permanently lit after half a second; this indicates that the Radio-Pad is operating correctly. If a fault still exists then check the data cable or the terminal.

An unsatisfactory test call is indicated by the service light turning on and off four more times, finally remaining on. If this happens, then try another Radio-Pad. If this is still unsuccessful then it is likely that reception is poor and the project engineer at Poole must be advised.

If the test call is completed successfully, the link between the terminal equipment and the Radio-Pad should be tested by attempting a call over the network by holding the door micro-switch(es) closed for more than 60 seconds. The yellow service light flickers to indicate the Radio-Pad is making a call. (**Note:** Releasing the switch(es) for 1 second causes a second message to be sent. This sequence can be repeated if desired.) If the service light does not flicker then this could indicate a fault in the CPU PCB or connecting cable.

- (k) Test that the Instation can set the sign by contacting the operator and requesting that the sign is set, confirm that the display is correct and then request that the sign is blanked.

NB. After a period without communication from the instation, the sign either blanks or displays a fault message. The period of inactivity (which varies from 10 minutes to 2 hours) and the wording of any message are site specific.

10. MAINTENANCE – INTELLIGENT CHARACTER UVMS

10.1 Safety Precautions

See section 1.5 for details of safety precautions to be taken when working on the sign and its associated electronics.

10.2 Routine Maintenance Procedure

The timetable below refers to a recommended maintenance interval. The actual timetable must be agreed with the regional maintenance controller.

10.2.1 Annual

- In areas of high pollution and dirty conditions the period between cleaning may have to be reviewed depending on site conditions.
Clean using a jet of water only.

Warning: Do not wipe the front screen as this will scratch the surface, which will affect the sign's optical performance.

- Signs should be visually checked to ensure that all LEDs on the sign are working correctly. Exercise all pixels on the sign by using the EMS Set Message function of the diagnostic terminal. See Appendix A4.3.3.1.
- Visually inspect for any paint work damage.
Repair as required.
- Check the operation of the gas struts on clam-shell signs.
Operate/cycle pivoting portion of the sign to lubricate the gas struts.
- Check the operation of the gas strut locking mechanism.
- Replace defective gas struts as necessary.
- Re-tighten all fixing screws and nuts as required.
- Check and grease the locks.
- Check the sealing strips for wear.
Repair as required.

- Check the sign for water ingress where this may affect operation. Repair as required.
 - Remove, clean and replace air filters.
 - Check incoming mains cable connector for wear.
 - Check the condition of the PCBs (i.e. scorching, corrosion etc.), batteries and fuses. Replace as necessary.
- Note:** When replacing a battery, the battery label must also be replaced or updated.
- Examine the diagnostic current fault log. Note and rectify any faults reported.
 - Check that the outputs of the power supplies are within the following limits:

12v +/-0.6v
5v +/-0.25v

If either of these is outside the limits then the power supply should be changed.

10.3 Fault Finding

On arrival at site the first action is to examine the "Diagnostic Current Fault Log" (See Appendix A4.4.3 for details). Any faults found here should be cleared by the appropriate action. Where communications between the sign and the diagnostic terminal cannot be established or the fault cannot be cleared simply, refer to the following tables.

10.3.1 Sign

Symptom	Diagnosis	Action
Sign not talking to Central Office	Incorrect address set at Sign	Set correct address on processor board
	RS485/232 Switch in the incorrect position (switch 4 switch 2).	Set switch to correct position.
	Fault in line between sign and central office.	Find and repair fault.

Symptom	Diagnosis	Action
Sign will not set but will communicate with Central Office.	EMS/EMI switch in the incorrect position (switch 4 switch 3).	Set switch to correct position.
Sign Run LED not flashing and watchdog LED is ON.	EPRoMs may be fitted incorrectly.	Check EPRoMs.
	Processor PCB faulty.	Replace Processor PCB
Sign Run LED not flashing but watchdog LED is OFF.	Address switch set to 00H or FFH	Set correct address.

10.3.2 Sign Characters

Symptom	Diagnosis	Action
LEDs on one character do not light at all.	Fault on character PCB (240mm).	Replace character.
LEDs on a group of characters do not light at all.	Fault on character PCB (150mm).	Replace character.
Run light flashes, sign refuses to set, LP7 flashes for long periods	Sign Processor to Character comms failed	<p>Remove connection to all rows, bar one. Wait until the power is removed then reapplied to the characters and LP7 flashes. Check no faults in log for the connected row. Connect another row and repeat until faults on connected row are found.</p> <p>Disconnect all inter PCB connectors on the affected row. Repeat test and check no errors on connected characters. Connect another PCB and repeat the test until a faulty connected character found.</p> <p>Replace the faulty character.</p>

10.3.3 Power

Symptom	Diagnosis	Action
PCB Power is OFF.	For 12V: Fuse blown and no short on power supply / wiring.	Replace fuse.
	For 12V: Fuse blown and short on power supply / wiring.	Replace fuse. Replace power supply / wiring
	For 5V: Fuse blown and no short on power supply / wiring.	Replace fuse.
	For 5V: Fuse blown and short on power supply / wiring.	Replace fuse. Replace power supply / wiring

10.3.4 Intelligent Character Testing

10.3.4.1 Introduction

The Intelligent Character Test software (which is part of the Maintenance Kit) allows UVMS Intelligent Characters to be operated directly from a Windows 95/98 PC without using the UVMS CPU PCB. Thus it is suitable for both bench testing of characters and complete signs.

In all cases the program tries to write to and display on as many characters as it can (unlike the UVMS CPU PCB, which only allows a display to be shown if all characters are fault free) regardless of how many may be faulty.

Issue 1 and 2 Character PCBs do not have ‘anti streaming’ and therefore can ‘hog’ the communications line and prevent any character communicating with the PC. In this case the sign can be split into smaller and smaller numbers of characters until the faulty ones are located.

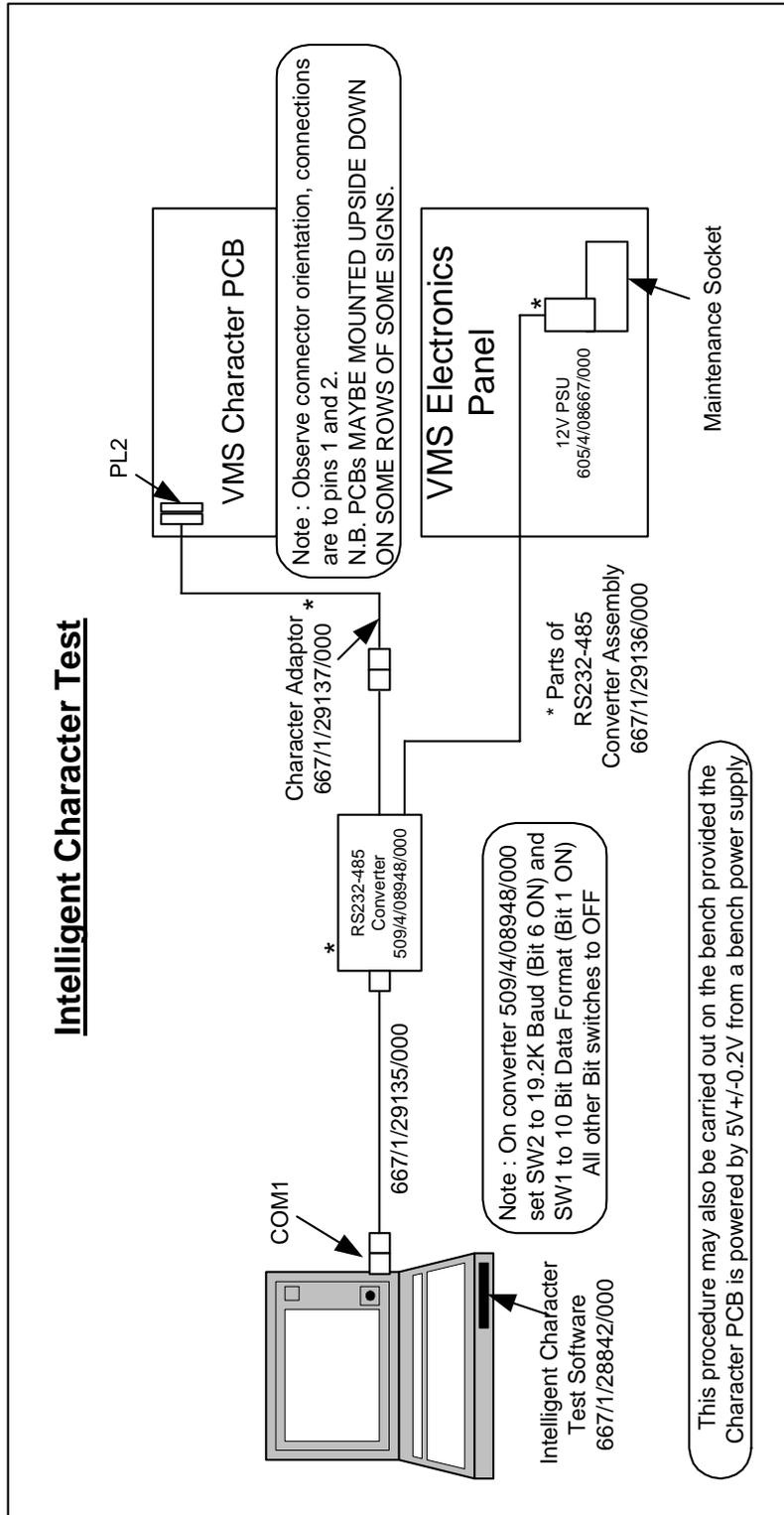


Figure 10 - Intelligent Character Test Setup

10.3.4.2 Setup

Figure 10 shows the setup for the test. The test equipment shown is part of the VMS Maintenance Kit (667/1/29132/000) and the PC specification is defined in Appendix E.

Use drawing 667/DB/27770/ETC, included in Appendix C, for reference.

1. Power down the sign.
2. Remove the RS485 connection from the CPU PCB.
3. If lanterns are fitted to the sign then de-power them by pulling fuses 9 and 10 (see drawings 667/GA/28085/ETC and 667/DB/28085/100 for the positions of these fuses).
4. Remove the power connector (PL1) from the CPU PCB.
5. Connect the RS485 flying leads from the Converter to any Character PCB RS455 header:
 - RED wire to PIN 1
 - WHITE wire to PIN 2
6. Re-power the sign and run the software.

10.3.4.3 Operation

1st Screen - Warnings and Password

Ensure the warnings are heeded and then enter the password (ICT ENTRY).

2nd Screen - Sign Size

Select the COM port that the Converter is attached to if different from COM 1.

Then enter the number of rows on the sign (maximum 4) and the number of characters per row (maximum 12).

3rd Screen - Sign Configuration

Select any rows that are inverted. These can be found by seeing which way up the character PCBs are placed in the sign for each row. Select the character size (1 per PCB = 240mm : 3 per PCB = 150mm)

The program now 'draws' the sign on the screen and data for each line can be entered. Only those letters, numbers and punctuation marks allowed by the HA can be displayed with one exception; entering a # causes all LEDs for that character to illuminate. N.B: Do not use the # for more than half the characters at any one time or the PSU may become overloaded.

The "SEND TO SIGN" button sends the data displayed on the screen to the sign.

The "TEST ALL LEDS" button illuminates all LEDs on each character in turn then re-displays any data.

The DOT below each display shows:

GREEN if the Character is OK

RED if it is faulty

YELLOW as it is being tested

WHITE as data is being sent.

Brightness can be adjusted with the BRIGHTNESS slider and the speed at which the sign is written to can be adjusted using the COMMS SPEED slider, which is useful for slowing down the test sequence.

10.3.4.4 Hints

1. Remember some PCB faults can hog the line so be prepared to isolate sections of the sign.
2. If spare character PCBs are used, they must have their addresses set for the positions that they occupy in the display.
3. If link wires are available it is perfectly acceptable to link round faulty or suspect character PCBs provided that both of the white linking connectors on those faulty character PCBs have been opened.
4. Do not forget to re-address character PCBs that are moved about in the sign or they will appear out of sequence (if two character PCBs end up with the same address they will interfere unpredictably).

10.3.4.5 Completion

At the completion of character testing, power down the sign and replace the fuses and connections removed during the test (described in section 10.3.4.2). Connect the Maintenance Terminal as described in Appendix A and set a message that exercises all characters, as described in A4.3.3.1 Set EMS Message.

10.4 Replacement of Component Parts

Before replacement of any components takes place, the sign should be completely switched off and isolated from the mains supply. The mains isolation should be made external to the sign enclosure, prior to working on / replacing components inside the sign enclosure.

10.4.1 Replacement of Processor PCBs

In the event of a PCB requiring replacement it must be replaced by a part of the same type and the same or higher issue state. Before removing the PCB note all switch settings and configure the replacement PCB in a similar manner. Swap the EPROMs and PLD on the faulty PCB with those from the replacement PCB. In order to replace a PCB, all the connections to that PCB should be removed. The PCB can then be removed from the panel. This is achieved by removing the retaining clips (or screws) at each corner.

When handling PCBs or electronic components, all reasonable precautions must be taking to prevent the damage of components by ESD.

10.4.2 Replacement of Power Supply

The Power Supply Unit is mounted on the metal panel adjacent to the Processor PCB. After ensuring that the mains supply is completely isolated, the procedure for replacement is as follows:

- Remove ELV connections from the power supply
- Remove LV (mains voltage) connections from the power supply

The power supply can now be unscrewed from the panel. Fit the replacement unit and reconnect the wiring.

UVMS signs that have battery backup fitted to allow transmission of mains failure must have the Lambda PSU voltages adjusted following replacement of the PSU as detailed below:

Ensure that the battery is disconnected. Referring to Figure 11 below, adjust the Lambda PSU 5V and 12V rails, as follows:

12V Rail - Monitor the voltage at the battery connection 'Faston' terminals and adjust the 12V PSU setting potentiometer until the voltage observed is $13.6 \pm 200\text{mV}$.

5V Rail - Monitor the voltage at the Battery Backup board 5V IN terminal with respect to its 0V terminal and adjust the 5V PSU setting potentiometer until the voltage observed is $5.3\text{V} \pm 50\text{mV}$.

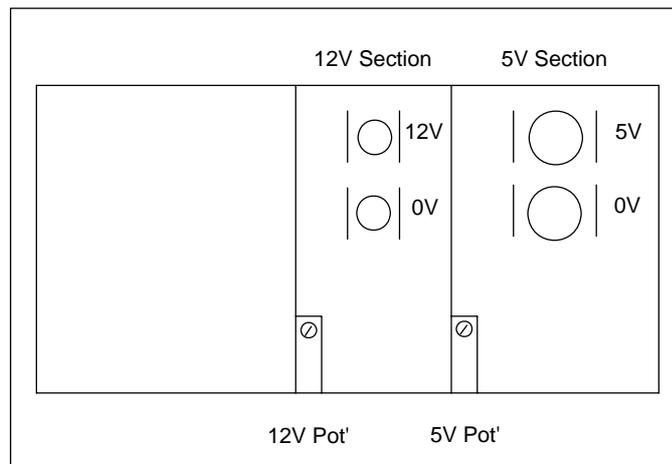


Figure 11 - Lambda PSU

Connect the Backup Battery.

10.4.3 Replacement of Items on the DIN Rail Assembly

Warning: Before removing any protective covers on the DIN rail assembly, ensure that the mains supply to the sign is isolated externally to the sign enclosure.

The protective cover must first be removed to gain access to the DIN rail mounted components. Remove and replace any required items.

10.4.4 Replacement of Miscellaneous Panel Mounted Items

All units on the mounting panel are fastened using studs/nuts/washers or rivnuts. In order to remove any item, the necessary fixing must first be unfastened.

Any item that is removed should be replaced by an identical item, identified by its STCL Part No.

10.4.5 Replacement of Characters

The character PCBs are screwed onto power rails, where there are rectangular cutouts in the front panel mounting plate. To replace a PCB follow the procedure below:

- Make sure sign power is switched off
- If the character is connected to other characters or main processor PCB, unclip the connectors.
- Unscrew the 4 screws holding the character PCB in place.
- Remove the character PCB from the front panel, noting the orientation of the PCB.

The character can now be replaced. The procedure for replacing the character into the sign is as follows.

- Replace the character PCB, ensuring the orientation matches the previous PCB. (The PCB is not polarity sensitive so incorrect orientation will cause damage).
- Screw in 2 of the 4 screws (3 screws on 240mm) loosely.
- Align the PCB so that the inter-PCB connectors can be connected (if required).
- Screw in the remaining screws and tighten all screws.
- Use the removed PCB's configuration label, and the configuration terminal to configure the new character PCB. See below for details.
- Fill in the details of the configuration label on the new PCB.

10.4.5.1 Configure New Character PCB

- Disconnect the inter-character connectors.
- Run the “Intelligent Character Configurator” software on a PC as defined in Appendix E. See section 10.4.5.2 below for details of how to set up the PC to operate the software.
- Connect the PC to the replacement character, as shown in Figure 12.

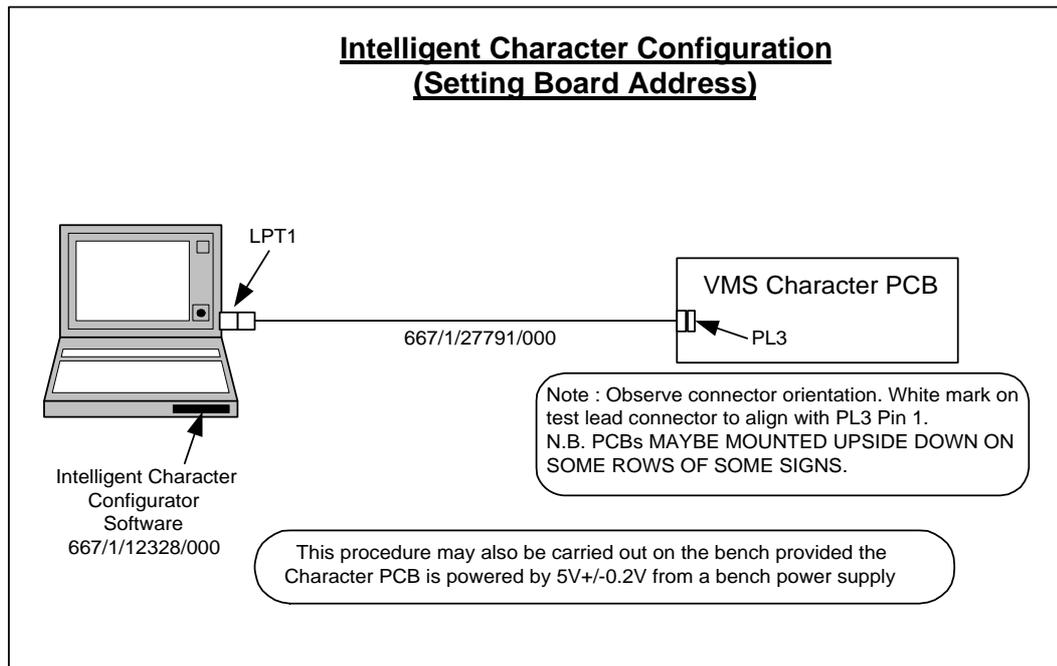


Figure 12 - Configure New Character PCB

- After the opening screen has cleared, click on the File menu and select Configure VMS Character.
- The screen displays the Programmer interface.
- Click on the Default button - this should load the default values for the following fields:
 - address
 - no. of characters per PCB
 - no. of pixels per character – do not change
 - Protocol baud rate – do not change
 - PWM Repetition Rate – do not change
- Enter the address of the character that has been replaced in the address field. This may be found by reading the address label on the rear of the old character.

- Enter the number of characters per PCB (3 for a 150mm high character, 1 for a 240mm character)
- Click on the Burn button to program the new character.
- Click OK on the dialog box that appears.
- To verify the burn, click the Read button and check that the contents of the EPROM are as entered.
- Affix a new EPROM label, with the address, to the lower left-hand corner of the PCB.
- Reconnect the inter-character connections.

10.4.5.2 PC Set-Up

In order to run the “Intelligent Character Configurator” software the PC must be set up as detailed below:

From the **Start** menu select **Settings > Control Panels**.

Select **System** from within **Control Panels**.

Select the **Device Manager** tab.

Double click **Port (COM & LPT)** to expand the display.

Select **Parallel Port (LPT1)**

Select **Properties**

Check in the **Resources** tab that the **Input/Output** range is 0378 to 037B.

Select **OK**.

10.4.6 Replacement of Heaters

The heater element is located at the lower edge of the display window. The heater is removed by releasing it from its retaining clips. The supply cable to the heater must then be disconnected to complete removal of the heater element.

The new heater element can then be installed and connected to the heater power supply.

10.4.7 Replacement of Light Sensor

The light sensor is mounted at the top of the sign enclosure. To replace a light sensor perform the following steps:

- Disconnect the red and white wires to the light sensor
- Unscrew the light sensor nut
- Remove the light sensor.

Ensure that any sealing rings are intact. The light sensor can now be replaced. The procedure for replacing the light sensor into the sign is the reverse of the removal procedure.

Once the faulty light sensor has been replaced it should be checked for correct working as follows:

- Connect the Diagnostic Terminal
- Display the 'Monitor Light Sensors screen' and check that the replaced light sensor is giving sensible readings.
- Display the 'Complete Fault Log' and check that an entry has been placed in the fault log showing clearance of the light sensor failure.
- Cover up the light sensor so that the readings are very low.
- Display the 'Monitor Light Sensors screen' again and check that the light sensor is giving very low readings.
- Uncover the light sensor.

For firmware issue 3 and onward:

Display the 'Complete Fault Log' and check that an entry has been placed in the log that the light sensor variation failure has cleared.

For firmware prior to issue 3:

Display the 'Complete Fault Log' and check when the light sensor variation failure was detected. This check is performed approximately every 24 hours, so note when the failure should be cleared. After that time, either return to the sign and check the fault log, or check that the light sensor failure bit is not set when the instation requests the status of the sign.

10.4.8 Replacement of gas Struts

Open the sign to its full extent and secure/clamp in its open position. Ensure that the clamping mechanism used prevents the sign closing when the gas struts are removed. Remove the gas strut securing screw and fit the new gas strut. Ensure that the locking mechanism on the new gas strut operates correctly and can hold the sign open. Remove the clamping mechanism and adjust the gas strut resistance to the require setting to hold the sign open but also allow the sign to be closed.

10.5 Spares

10.5.1 Component Parts

The UVMS Signs contain no user serviceable parts except for fuses. In the event of failure the whole faulty item must be replaced with an identical unit. The Siemens part number of each spare part is listed below.

Item	Siemens Part No.
Processor PCB Assembly	667/1/24620/001
150 Intelligent Characters PWB Assembly	667/1/27891/000
240 Intelligent Characters PWB Assembly	667/1/28015/000
Light Sensor	667/7/24680/000
Coutant Lambda PSU 5V & 12V	667/7/28096/000
Heater	418/4/39817/000
RS485 Line Protection PCB	667/1/20584/001
Lantern Control Unit	667/1/26185/001
Pulse Switcher	667/1/26185/000
Battery Charger	667/1/28547/000
Gas Strut (Short)	999/4/44160/000
Gas Strut (Medium)	999/4/44267/000
Gas Strut (Long)	999/4/44194/000

10.5.2 Consumables

Ref	Location	Type	Siemens Part No.
FS1	Din Rail	5A 240V BS1361 HRC	518/4/90638/000
		FUSE AUTOMOTIVE 2A 32V Grey	518/4/97046/001
		FUSE AUTOMOTIVE 10A 32V Red	518/4/97046/006
		FUSE AUTOMOTIVE 15A 32V Blue	518/4/97046/007
		Rechargeable battery 12V	418/4/42314/010
	Processor PCB	QB 500mA fuse	518/4/90285/004
	Processor PCB	3V Lithium battery	418/4/97186/000

Warning: Fuses must only be replaced with ones of the correct type and rating. The use of incorrect fuses may irreparably damage the equipment.

A USE OF THE MAINTENANCE TERMINAL

A1 GENERAL DESCRIPTION

A1.1 Introduction

The Diagnostics Terminal consists of a portable personal computer and installed software that operates in a Microsoft Windows environment. It has been designed to aid maintenance engineers with the varied day to day interface needs of the different variable message signs. Simple to use menu driven operations enable set-up and maintenance tasks to be undertaken with ease.

Words enclosed by chevrons, e.g. <Enter>, <Esc>, indicate computer keys.

A2 HARDWARE DESCRIPTION

The hardware required to run the VMS Diagnostics Terminal software is a personal computer (see Appendix E) with a suitable lead to connect to the RS232 serial port of the processor as shown in Figure 13.

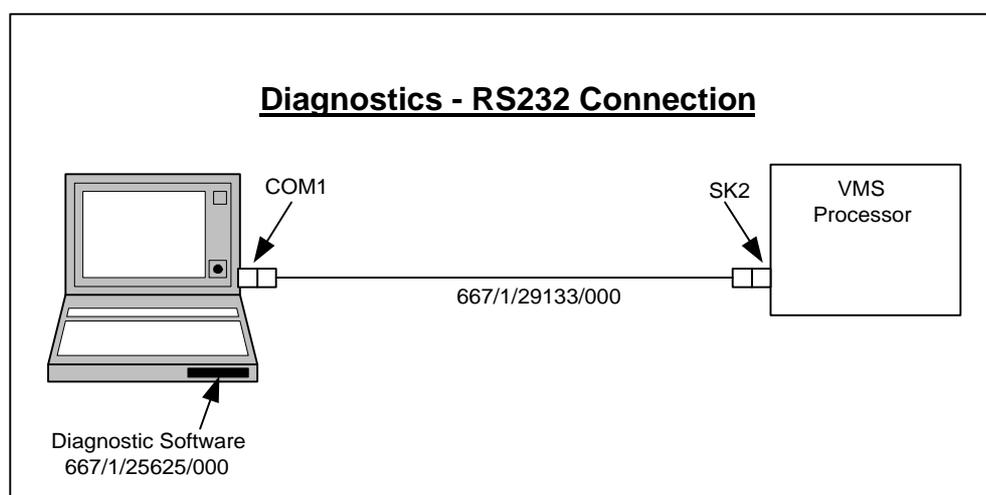


Figure 13 - Diagnostic Terminal Hardware Setup

A3 GETTING STARTED

A3.1 Introduction

The Diagnostics Terminal software is supplied on a 3.5" 1.44 Mbyte floppy disk. It comes with an automatic installation program called SETUP. This program creates directories as needed and transfers files from your distribution disks to the PC's hard disk.

A minimum of 1 Mbyte of disk space is needed on the destination drive for the Diagnostics Terminal software; in addition to space required for any report data files that may be created when the software is run.

It is assumed that MS-DOS and Windows have already been installed on the portable PC and that the operator is reasonably familiar with DOS commands.

A3.2 Installing the Diagnostics Terminal Software

The Diagnostics Terminal software is protected to stop unlicensed versions of the software being generated. The Customer issued disks are limited to a certain number of installations. If subsequent installations are attempted the software fails to be invoked.

To install the Diagnostics Terminal software:

- Boot up the portable PC.
- Ensure that the DOS system prompt is displayed.
- Start Windows.
- Insert the installation disk (Diagnostic Terminal DISK #1 part number 667/1/25625/000) into drive A.
- From **File Manager** select drive A and then double click on the **setup** program.
- Follow the instructions displayed - this involves confirming or changing the destination pathname. The Windows group and icon are all created automatically.

A3.2.1 Using Diagnostics Terminal Software on Windows 95

There is an identified problem running the software with Windows 95 that can be overcome in the following way:

- From the **Start** button select **Settings** and then **Control Panel**
- Double Click the **System** icon. This opens a dialog titled **System Properties**
- Select the **Device Manager** tab and scroll down the list until you reach an item labelled **Ports (COM and LPT)**
- Double Click the **Ports** item to show all the COM and LPT ports on the PC
- Select the COM port that is used to connect to the sign, and press the **Advanced** button
- Select the **Port Settings** tab and select the **Advanced** button from the displayed dialog
- Remove the tick from the check box labelled **Use FIFO Buffers**
- OK all the displayed dialogs and close the **Control Panel**.

It is now possible to run the Diagnostic Terminal and connect to the sign via the RS232-485 converter.

Note: Some applications and utilities that make extensive use of the COM port (such as serial printers, or network comms applications) may require this to be re-enabled when used. If other applications use the COM port it is possible to re-enable the FIFO buffering and only disable it when using the VMS Diagnostic Tool. To re-enable the FIFO buffering follow the procedure outlined above, but make sure the **Use FIFO Buffering** check box has the tick enabled.

A3.3 System Start-Up

Once the Diagnostics Terminal software has been installed, to start the program, enter Windows and then select the **Diagnostics Terminal** icon from the **VMS DIAGNOSTIC** window.

Alternatively, invoke the program from the **FILE - Run** option of the main window, specifying the path to the file **VMS_DIAG.EXE**.

When started, the terminal attempts to establish a connection with the UVMS. If it is unable to do this, the software notifies the operator and exits.

Note: The terminal software must be exited before disconnecting or switching the computer off, as the terminal must establish a disconnect with the UVMS.

A4 USERS' GUIDE

A4.1 Menu Structure

The system is completely menu driven and the various facilities are invoked simply by selecting the required menu option. The following table lists the options available. The number associated with each menu option refers to the section where the facility is described in detail.

• Control	A4.3
Reset Fault Log	A4.3.1
RT Clock	A4.3.2
Settings	A4.3.3
Set EMS message	A4.3.3.1
Set EMI drive code	A4.3.3.2
Set Dim/Bright	A4.3.3.3
Set Lantern Override	A4.3.3.4
Simulator Faults	A4.3.4
Tests	A4.3.5
Test Results	A4.3.5.1
Run Test 2	A4.3.5.2
Heater Test	A4.3.6
Set Password	A4.3.7
• Reports	A4.4
Current Sign Driver Status	A4.4.1
Switch States	A4.4.2
Sign Driver	A4.4.2.1
VMS Sign	A4.4.2.2
Fault Log	A4.4.3
Current Faults	A4.4.3.1
Complete Fault Log	A4.4.3.2
Monitor Light Sensors	A4.4.4
• Factory Self Test	A4.5
Start Factory Self Test	A4.5.1
Stop Self Test	A4.5.2
Report Factory Self Test Results	A4.5.3
Print Self Test Results	A4.5.4
Test RS485 Link	A4.5.5
9600 Baud	A4.5.5.1
2400 Baud	A4.5.5.2

Test RS232 Link	A4.5.6
• MSG Seq	A4.6
Message Sequencing	A4.6.1
• Stop	A4.7
• Exit	A4.7.1

A4.2 Password Protection

Some of the menu options are protected by a password for security reasons. The operator is allowed three attempts to enter a valid password, after which the system aborts the selected option. However, it is only necessary to enter the password just once during a session, i.e. while still in the Diagnostics Terminal. The Simulator Faults, Factory Self Test and MSG Seq. options are protected by two passwords for additional security.

A4.3 Control

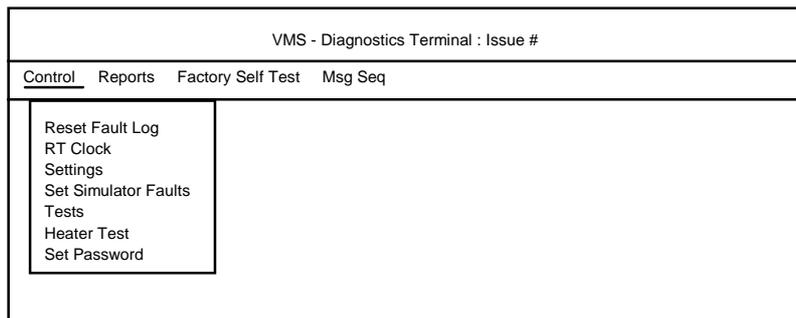


Figure 14 - Control Menu Options

A4.3.1 Reset Fault Log

This facility is protected by a password. On selection of this option, the operator is first prompted to enter the password unless one has been entered successfully during the current session.

Upon entry of a valid password, a dialog box is displayed which prompts selection of the 'Reset' button to reset the Fault Log. Select 'Cancel' to avoid clearance of the Fault Log.

If the 'Reset' button is selected, a message confirms if the Fault Log has been cleared.

A4.3.2 RT Clock

This facility enables the sign clock to be both read and set.

On selection of this option, the sign clock is read and the retrieved data displayed in a dialog box. Then either 'Quit' or change the time and/or date values and 'Send' the changes.

If 'Send' is selected and a password has not previously been entered during the current session, the operator is prompted to do so. When a valid password has been entered, the time and date are transmitted to the sign and used to reset the clock. The clock is immediately re-read and the new values sent back to the terminal and displayed.

Note: The data entry dialog box performs validation checks on the time and date values entered before sending them to the sign. Any errors are notified and the software offers an opportunity to correct them before proceeding. The terminal will not send an invalid date or time to the sign.

A4.3.3 Settings

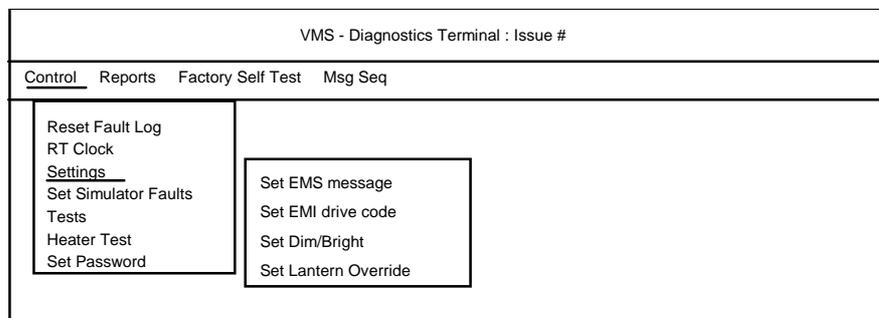


Figure 15 - Control - Settings Menu Options

A4.3.3.1 Set EMS Message

This option enables the operator to set the message on an EMS sign. It is password protected similar to the Reset Fault Log option.

The system checks the type of the sign connected. If the sign type is not EMS, an error message (see Appendix A5) is displayed to inform the operator of this

and the option is aborted. Otherwise, the system proceeds and displays STATUTORY WARNINGS that must be read carefully to make sure that all the conditions are met before proceeding. Select 'Cancel' to abort if these conditions have not been met.

This facility enables the operator to set the text message on the sign, together with the lantern requirement (lanterns ON/OFF) and the lantern override switch (ON/OFF). The lantern requirement and lantern override switch are set by means of check boxes; an X in the check box indicates that the option is set to ON.

Note: If the 'lantern override' switch is set to OFF, the lantern requirement setting is ignored.

To specify the text to set, enter the text directly in the text message field, noting that to move to the next line press <CTRL + RTN>. The text will only be set on the sign if it is compatible with the sign's size. There is no error message concerning a set not being accepted.

To set the message on the EMS to one of the stored messages, the first character in the text message field **must** be '#' and **must** be followed immediately by the Stored Message Code (with no intervening spaces or tabs). The Stored Message Code must be in the range 0 to 47, e.g. #25; if it is not within the range an error message is reported (see Appendix A5). The terminal will not send an out of range Stored Message Code to the sign.

This facility is also used to test all the characters on a sign during a routine maintenance visit (see sections 7.2.1 and 10.2.1). This may be achieved by setting all the pixels of all the characters on one row of the sign, asking for a visual check and moving on to the next row. The way to set all the pixels on one character is by pressing <Alt> 0146 at the numeric keypad.

Select 'Quit' to stop setting messages.

A4.3.3.2 Set EMI Drive Code

This option, which enables the operator to set the Aspect on an EMI sign, is not used for UVMS.

A4.3.3.3 Set Dim/Bright

This option enables the operator to set the Dim/Bright level on EMS and sign types. It is password protected similar to the Reset Fault Log option.

On selection of this option, after checking for entry of a valid password, the system displays STATUTORY WARNINGS that must be read carefully to ensure that all the conditions have been complied with before proceeding. Select 'Cancel' to abort if these conditions have not been met.

The level is set to DIM or BRIGHT by means of "radio buttons", only one of which may be selected at any one time.

Select 'Quit' to leave this option.

A4.3.3.4 Set Lantern Override

This option enables the operator to set the lantern override switch on EMS signs to either ON or OFF. It is password protected similar to the Reset Fault Log option.

On selection of this option, after checking for entry of a valid password, the system checks the type of the sign connected. If the sign type is not EMS, an error message (see Appendix A5) is displayed to inform the operator of this and the option is aborted. Otherwise, the system displays STATUTORY WARNINGS that must be read carefully to ensure that all the conditions have been complied with before proceeding. Select 'Cancel' to abort if these conditions have not been met.

The lantern override is set by means of a check box; an X in the check box indicates that lantern override is set to ON.

Select 'Quit' to leave this option.

Note: If the lantern override switch is off, the lantern requirement settings are ignored.

A4.3.4 Simulator Faults

For security reasons this option is protected by two passwords. If a password has already been entered during the current session, only the second password is required.

On selection of this option, after checking for entry of a valid password, the system displays a STATUTORY WARNING that must be read carefully to ensure that all the conditions have been complied with before proceeding.

A dialog box is displayed, with a list of faults relevant to the type of sign connected. If the option has been accessed during the current session, the previously sent faults are highlighted, if the option has not been accessed before, then no faults are highlighted.

A fault can be selected or de-selected by highlighting or un-highlighting it respectively. When the chosen faults have been selected, 'Send' can be selected to send the highlighted faults. None or more faults can be sent. If 'Cancel' is selected the dialog box is refreshed, and displays the faults previously sent (if any). If 'Stop' is selected the option is aborted without sending any faults.

A4.3.5 Tests

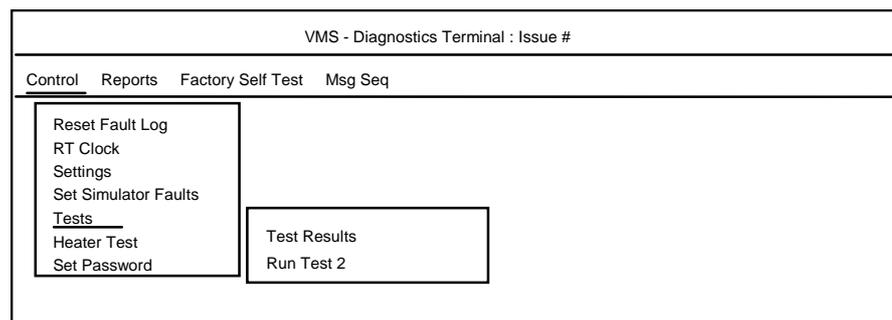


Figure 16 - Control Tests Menu Options

A4.3.5.1 Test Results

This facility provides a simple report consisting of the result of the last Test 2 run on the sign (see Appendix A4.3.5.2). It displays two bytes of data in binary format. It is not possible to save this report to a data file.

On selection of this option, the system checks the type of the sign connected. If the sign type is not EMS, an error message (see Appendix A5) is displayed to inform the operator of this and the option is aborted.

A4.3.5.2 Run Test 2

This facility enables the operator to run a Test 2 on an EMS. It is password protected similar to the Reset Fault Log option. Test 2 runs the following sequence:

- 1 Checkerboard1 on row1, 'SIGN TEST' on row2
- 2 Checkerboard2 on row1, 'SIGN TEST' on row2
- 3 'SIGN TEST' on row1, checkerboard1 on row2
- 4 'SIGN TEST' on row1, checkerboard2 on row2
- 5 'SIGN TEST' on row1, one block on row2, luminance level 1
- 6 'SIGN TEST' on row1, two blocks on row2, luminance level 2
- 7 'SIGN TEST' on row1, three blocks on row2, luminance level 3
- 7 'SIGN TEST' on row1, four blocks on row2, luminance level 4

Luminance level 1 is the level set when the ambient light is dimmest and level 4 is set when ambient light is brightest.

On selection of this option, after checking for entry of a valid password, the system checks the type of the sign connected. If the sign type is not EMS, an error message (see Appendix A5) is displayed to inform the operator of this and the option is aborted. Otherwise, the system proceeds and displays STATUTORY WARNINGS that must be read carefully to ensure that all the conditions have been complied with before proceeding. Select 'Cancel' to abort if these conditions have not been met.

Select 'Quit' to leave this option and the sign is automatically cleared.

A4.3.6 Heater Test (not applicable to UVMS)

This facility enables the operator to force the sign to perform a heater test; it then retrieves and displays the result which is either PASS or FAIL.

A4.3.7 Set Password

This facility enables the operator to reset the password. It is, of course, password protected. On selection of this option, after checking for entry of a valid password, the system displays a dialog box containing two fields:

- New Password.
- Confirm New Password.

Enter the new password in both fields before selecting the 'OK' button.

Warning: The first level password can be changed by anyone with first level password access. Contact Poole site if the password is forgotten.

Note: The password applies only to the machine on which the Diagnostics Terminal software is installed; it is not written to the sign. It is not possible to reset the second level password.

A4.4 Reports

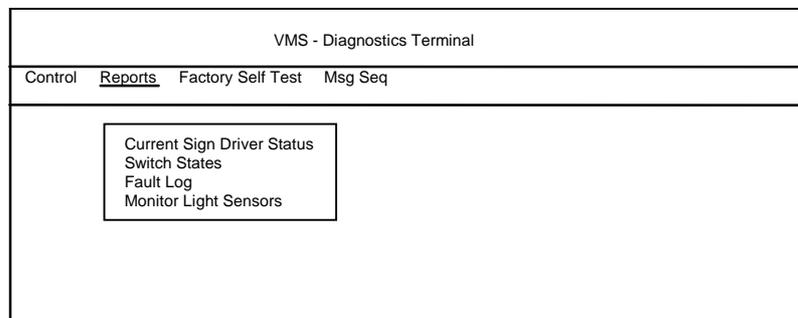


Figure 17 - Reports Menu Options

A4.4.1 Current Sign Driver Status (not normally applicable to UVMS)

This option provides a report of the current sign status. The data is retrieved from the sign driver and, therefore, the terminal must be connected to a sign driver. If no sign driver is connected, an error message (see Appendix A5) is displayed instead of the report. It is not possible to save the contents of this report to a file.

The data retrieved and displayed is:

- Device Mod Code
- Issue State
- Message
- CRC
- Dim/Bright setting
- Lantern Status

A4.4.2 Switch States

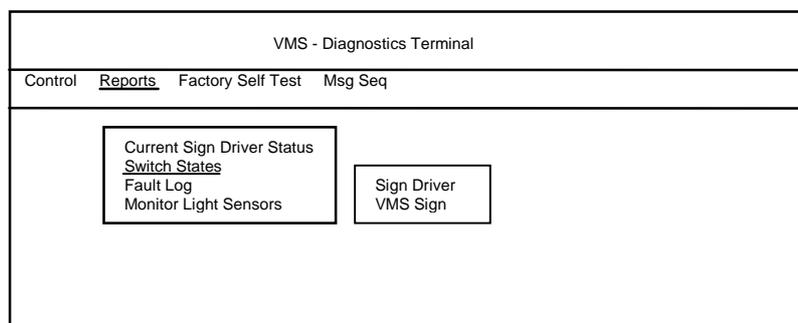


Figure 18 - Reports - Switch States Menu Options

A4.4.2.1 Sign Driver (not normally applicable to UVMS)

This facility provides a report of the sign driver ‘switch’ states. However, the switches reported are not all switches in the common sense of the word. They are as follows:

- Address.
- EMS/EMI (always EMS in the case of UVMS).
- EMS type.
- Interface (Transponder/Stand Alone Controller).
- Luminance Override.

The following may appear in a number of fields:

1. N/A - Not Applicable
2. U/A - unavailable

A4.4.2.2 VMS Sign

This facility provides a report of the UVMS Sign ‘switch’ states. However, the switches reported are not all switches in the common sense of the word. They are as follows:

- Address.
- EMS/EMI (always EMS in the case of UVMS).
- Lithium Battery.

The following may appear in a number of fields,

1. N/A - Not Applicable
2. U/A - unavailable

A4.4.3 Fault Log

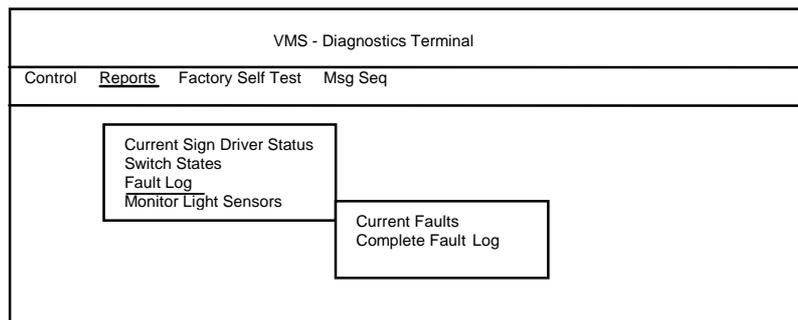


Figure 19 - Reports - Fault Log Menu Options

A4.4.3.1 Current Faults

This facility provides a report of the current faults obtained from the sign. The report is displayed in a dialog box.

This report may be saved to a data file by selecting the ‘Save’ button; enter a name for the file in which to store the report. All file names are subject to the usual MS-DOS limitations. The system checks the entered file name and, if it already exists in the system data file directory, flags an error; it is not possible to overwrite an existing file with the same name. The path for the Diagnostics Terminal data file directory is \DATFILES, which is contained in the installation directory.

A4.4.3.2 Complete Fault Log

This facility provides a report of the complete fault history since the last reset. This is obtained from the sign. The report is displayed in a dialog box.

This report may be saved to a data file by selecting the 'Save' button; enter a name for the file in which to store the report. All file names are subject to the usual MS-DOS limitations. The system checks the entered file name and, if it already exists in the system data file directory, flags an error; it is not possible to overwrite an existing file with the same name. The path for the Diagnostics Terminal data file directory is \DATFILES, which is contained in the installation directory.

A4.4.4 Monitor Light Sensors

This facility provides monitoring of the ambient light sensors. The values are displayed in a dialog box and are continually updated.

Select 'Quit' to leave this option.

Since the data in this report is dynamic, it is not possible to save this report to a data file.

A4.5 Factory Self Test

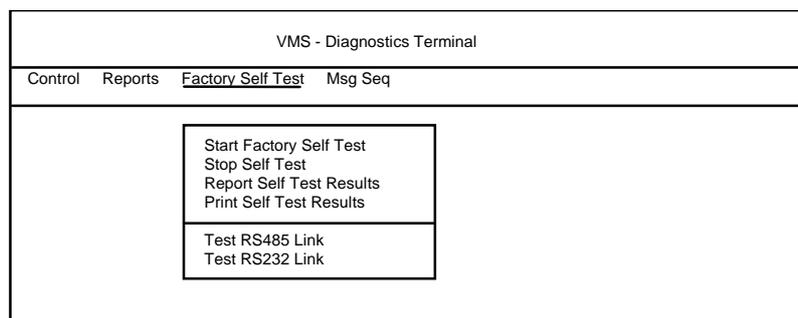


Figure 20 - Factory Self Test Menu Options

A4.5.1 Start Factory Self Test

This facility enables the operator to initiate a Factory Self Test. This test is used to soak test the signs in the factory. Each test consists of five sign settings as follows:

- 1..First set of alternate pixel rows set, lanterns off.
- 2..Second set of alternate pixel rows set, lanterns off.
- 3..First set of alternate pixel rows set, amber lanterns flashing (if fitted).
- 4..Second set of alternate pixel rows set, lanterns off.
- 5..Sign blank, lanterns off.

Once a self test has been started, the sign takes over and performs the actual tests. For security reasons this option is protected by two passwords. If a password has already been entered during the current session, only the second password is required.

Note: This facility must not be invoked outside the factory even if the second password is known.

Before selecting this option, ensure that the UVMS processor and the RS232 Engineers' Terminal port are connected as shown in Figure 13.

Before starting a Factory Self Test, a number of parameters must be entered:

- Lantern type (always amber for UVMS).
- Sign size (number of rows and number of columns).
- Test duration (in hours).
- Cycle time (in minutes).
- Setting time (in seconds).

A maximum value of 255 applies to all these fields.

The '**Test duration**' parameter defines the overall time for the test to run. If the operator enters **0** for this parameter, the sign runs the test cycle **once** only.

The '**Cycle time**' parameter defines how often each cycle is to run during the self test, i.e. the gap between each test cycle. This value must be at least five times the 'setting time'.

The '**Setting time**' parameter defines how long each display remains set on the sign.

The '**Lantern type**' parameter defines which lanterns are tested (red, amber or both). The lantern test requirement is set by means of two check boxes, one for red lanterns and one for amber lanterns. Only the box for 'amber lanterns' should be checked.

All the parameters contain default values when the dialog box is first displayed. These values may be used or replaced.

In addition to the parameters entered, the system obtains the date on which the test is started from the PC and this is added to the parameter list automatically.

The sign size is validated before the test is started and the operator is informed if the size entered is different from that configured in the sign.

The Factory Self Test operates in cycles, each consisting of a set of pre-defined tests. In between cycles, the sign does not display anything and the sign appears to be inactive. The test cycle runs as many times as the overall test duration time allows. Each display that is part of the test (including the lantern test) remains set for the duration of the '**Setting time**' parameter.

When all parameters have been entered, select the 'Start' button to start the test running. Once this has been done, the option may be exited and it is possible to continue working on other options or applications or to disconnect the terminal from the sign.

All faults detected are logged and counted.

The Factory Self Test may only be interrupted between test cycles and the Self Test Results obtained using the **Report Factory Self Test Results** option, (See Appendix A4.5.3). However, a report obtained at this time will obviously be incomplete and contain only the results so far.

It is possible to stop the Factory Self Test in between test cycles using the **Stop Self Test** option (See Appendix A4.5.2).

The Factory Self Test stops automatically at the end of the test duration time.

A4.5.2 Stop Self Test

This facility enables the operator to stop a Factory Self Test before it has completed.

Select the 'Stop' button to stop the test or 'Continue' to continue.

Note: Any commands selected during a Factory Self Test will only be accepted if they are sent between test cycles, i.e. while the Sign is Blank.

A4.5.3 Report Factory Self Test Results

This facility provides a report of the results of the Factory Self Test obtained from the sign. It may be invoked both during a Factory Self Test and after a Self Test has run to completion.

The report is similar to the fault log report but it also contains a count of occurrences of each fault. It also contains the Device Mod Code and Issue State of the sign together with the self test parameters that were used to start the test. The report is displayed in a dialog box.

This report may be saved to a data file by selecting the 'Save' button; enter a name for the file in which to store the report. All file names are subject to the usual MS-DOS limitations. The system checks the entered file name and, if it already exists in the system data file directory, flags an error; it is not possible to overwrite an existing file with the same name. The path for the Diagnostics Terminal data file directory is \DATFILES, which is contained in the installation directory.

A4.5.4 Print Self Test Results

This facility is provided specifically to make it easy for the operator to obtain a print out of Factory Self Test Results. However, this facility may be used to print any data files that have been created using the 'Save' button in any of the reports.

A4.5.5 Test RS485 Link

A4.5.5.1 9600 Baud (Not applicable to UVMS signs)

This facility enables the operator to test the Sign Driver RS485 Link (9600 baud) at the Sign Enclosure. Once a test is started, a single test message is sent down the link and the software waits for the corresponding reply. The result is displayed as PASS or FAIL. For security reasons this option is protected by **two** passwords. If a password has already been entered during the current session, only the second password is required.

A4.5.5.2 2400 Baud

This facility enables the operator to test the Transponder RS485 Link (2400 baud) at the sign. Once a test is started, a single test message is sent down the link and the software waits for the corresponding reply. The result is displayed as PASS or FAIL. For security reasons this option is protected by **two** passwords. If a password has already been entered during the current session, only the second password is required.

A4.5.6 Test RS232 Link

This facility enables the operator to test the SAC (Stand Alone Controller) RS232 Link at the sign. Once a test is started, a single test message is sent down the link and the software waits for the corresponding reply. The result is displayed as PASS or FAIL. For security reasons this option is protected by **two** passwords. If a password has already been entered during the current session, only the second password is required.

A4.6 MSG Seq.

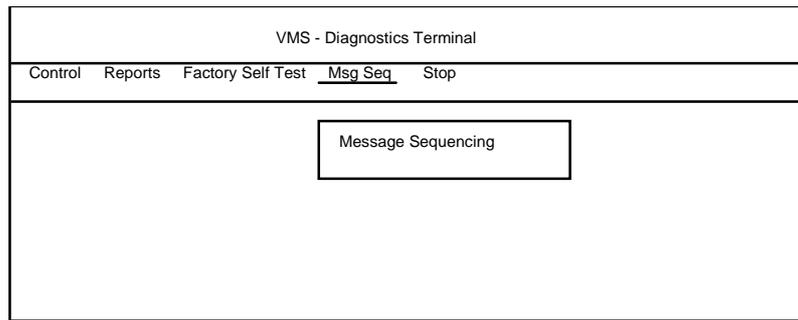


Figure 21 - Message Sequencing Menu

A4.6.1 Message Sequencing

This facility enables the operator to initiate a sequence of preset messages to be displayed on the UVMS Sign.

For security reasons this option is protected by **two** passwords. If a password has already been entered during the current session, only the second password is required.

It retrieves and displays the result of the settings, which is either OKAY or FAIL.

Select the 'Stop' button to stop the sequencing. This blanks the Sign automatically.

A4.7 Stop

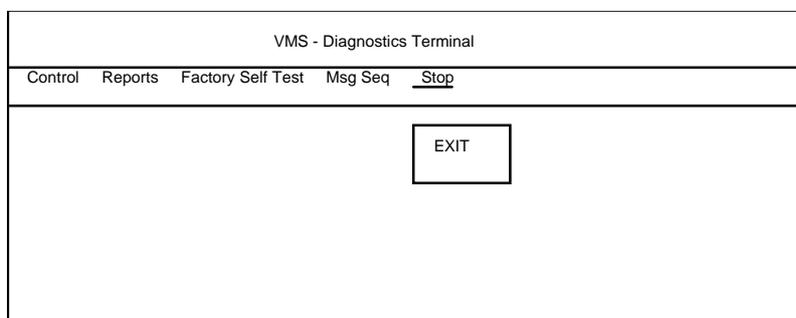


Figure 22 - Stop Menu

A4.7.1 Exit

This exits the current Diagnostic Terminal application. The exit function must be confirmed. If confirmed the Terminal tries to establish a disconnect with the UVMS Sign. Only if the disconnect message is replied to correctly does the Diagnostic Terminal Application terminate.

A5 ERROR MESSAGES

The following is a list of error messages likely to be encountered, where they are likely to be encountered and a brief description of their likely cause.

Unable to Establish a Connection

The Diagnostic Terminal has not received a reply from the UVMS Sign to its connection request messages. Check that the computer is connected to the Sign and to the correct port.

Unable to Disconnect from the VMS Sign

The Diagnostic Terminal has not received a reply from the UVMS Sign to its disconnection request messages. Check that the Sign is still running and that the computer is connected to the Sign and to the correct port.

Error in TIME

RT Clock - either the 'hours' field contains a value greater than 23 or the 'minutes' field contains a value greater than 59.

Faulty Comms reception - sign driver reply corrupted

Most facilities - this usually means that the terminal is not properly connected to the sign.

File with entered name already exists - Please re-enter file name

Reports (when the 'Save' button has been selected and a name for a new file to be created entered) - the file name entered has been found in the data directory \DATFILES.

Invalid entry in DAY field

RT Clock - the value in the day field is either less than 1 or incorrect for the month and year combination, e.g. 31-4-95, 29-2-99.

Invalid entry in MONTH field

RT Clock - the month field contains a value greater than 12 or less than 1.

Invalid Password

All options that are password protected - the password has been entered incorrectly.

Invalid Password - Process Aborted

All options that are password protected - if, after three attempts, the password has still not been entered correctly, this message is displayed and the software then returns to the main menu of the Diagnostics Terminal.

New password and confirm password inconsistent

Set password - the character strings entered in the 'new password' field and the 'confirm password' field do not match; enter the new password in **both** of these fields **before** selecting the 'OK' button.

Number of characters or number of rows is incorrect for configuration

Start Factory Self Test - the sign size is configured in the sign; this message appears if the values entered in the 'number of characters' field and/or 'number of rows' field are not the same as those in the sign configuration.

Self Test Parameter is greater than 255

One of the parameters entered in starting a factory self test is greater than 255.

Setting time and Cycle time contain inconsistent values - please correct

Start Factory Self Test - each cycle contains a number of pre-defined tests, each of which remains set for the number of seconds entered in the 'setting time' parameter; this message is displayed if the 'setting time' is such that the test cycle exceeds the cycle time parameter.

Sign Type is EMS - Red lanterns should not be set

Start Factory Self Test - EMS signs do not have red lanterns; this message appears if the terminal is connected to an EMS sign and red lanterns are selected as one of the lantern type parameters.

Stored Message Code entered is out of range

Set EMS - a Stored Message Code (after the '#') which is either greater than 31 or contains a non-numeric character which causes the code to go out of range (between 0 and 31).

Wrong sign type for function

If the terminal is connected to an EMS sign and the operator tries to select the Set EMI option, this message appears.

A6 REPORTED FAULTS

Fault numbers not included in this table are for design proving only.

The first byte is the fault number,
the second byte is fault category:

00	WARNING
01	FAILURE
02	CLEARED
03	FATAL

bytes 3 to 6 are data bytes.

The following are example faults:

07 01 00 00 00 00	The mains has failed or been switched off.
72 01 5D 01 63 01	Light sensor 1 is showing too little variance (it may be dirty or faulty). The minimum reading over 24 Hrs was 015D Hex and the maximum was 0163 Hex.
60 01 01 05 00 00	The sixth character from the left (viewing from the front) on the second row has two pixels with faulty LEDs.

Note: If a fault 11 other than those shown in the following table is logged, the fault and its data should be reported to Engineering.

A6.1 Sign Enclosure Faults

This is a comprehensive list of faults; not all are applicable to all signs.

FAULT	FAULT NAME	DATA1	DATA2	DATA3	DATA4
7	MAINS POWERFAIL	00	00	00	00
11	SD TO SIGN COMMS FAULT	XX	09	00	00
11	SD REQUESTED RESET	XX	08	00	00
35	CLOCK FAULT	00	00	00	00
37	BATTERY FAULT	00	00	00	00
39	LANTERN BULB FAIL	01/02	00	00	00
50	HEATER FAIL	HEATER CURRENT	00	00	00
51	OVERTEMP FAIL	00	00	00	00
53	AMBER LANT PAIR FAULT		00	00	00
54	AMBER LANT CYC STS FAULT	01/02	00	00	00
55	RED LANT CYC STS FAULT	01/02	00	00	00
56	DISK SUPPLY FAIL	00	00	00	00
57	LANT SUPPLY FAIL	00	00	00	00
58	LED SUPPLY FAIL	00	00	00	00
59	LED FAULT	ROW	COL	00	00
60	CRITICAL LED FAULT	ROW	COL	00	00
63	CHAR LED SHORT CIRCUIT	ROW	COL	00	00
64	DISK FAULT	ROW	COL	00	00
65	CRITICAL DISK FAULT	ROW	COL	00	00
66	LIGHT SENSOR1 FAULT	LIGHT LEVEL		00	00
67	LIGHT SENSOR2 FAULT	LIGHT LEVEL		00	00
68	LUMINANCE FAULT	00	00	00	00
72	SENSOR 1 LIGHT VARIANCE FAULT	LIGHT LEVEL MIN		LIGHT LEVEL MAX	
73	SENSOR 2 LIGHT VARIANCE FAULT	LIGHT LEVEL MAX	LIGHT LEVEL MIN	00	00
74	EMI LUMINANCE INPUT FAULT	00	00	00	00
75	RED LANTERN PAIR FAULT		00	00	00
76,77,78	INTELLIGENT CHARACTER FLT	XX	XX	ADDR	00
128	RESTART MESSAGE	00	00	00	00

A6.3 Literal Definitions

SYMBOL	VALUE
XX	IGNORE
01	TOP/LEFT
02	BOTTOM/RIGHT

B. INSTALLATION/COMMISSIONING CHECKLIST

Electrical Tests

Test	At Sign	At Pillar	Notes
Earth Bonding			Record worst figure (highest value)
Insulation			Record value
Earth Loop			Enter reading and where test performed
Prospective Short Circuit			Enter reading
RCDTest			Enter the two times obtained
Notes:			

Functional Tests and Setup

Set-Up	Data/Checked	Notes
12V Supply		
5V Supply		
Battery Date(s)		Enter date on battery/-ies
Li Battery Switch to 'ON'		
Sign Address (S2)		Record address setting
Luminance Levels (S3)		Record setting
Mode Switches (S4)		Record setting
Light Sensor functioning		
Battery Support functioning		If fitted
Battery charging		If fitted
Paknet/Modem checked		
Door Switch Report		If fitted
Heater checked		
Lantern Test		If fitted
Test 2		If safe to do test
Real Time Clock set up		
Central Office Control of Signs		
LED Status correct		
Fault Log		Clear Fault Log before leaving
Notes:		

Signed:

Date:

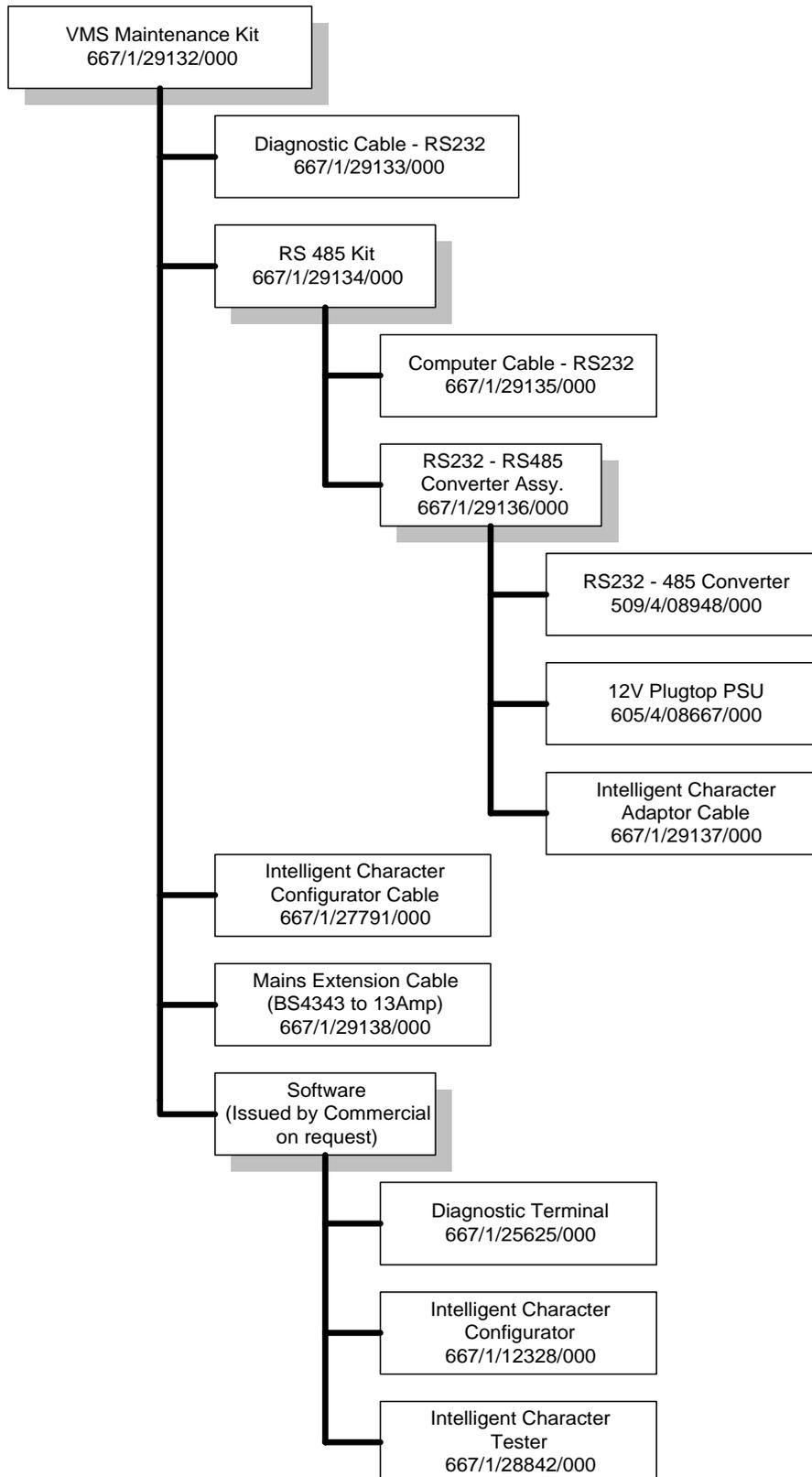
C. TECHNICAL DRAWINGS

This Appendix contains the following drawings:

667/DA/28547/ETC	UVMS Battery Charger PW Board Details
667/DB/27770/ETC	Intelligent Character Sign Schematic Diagram
667/DB/28085/100	Intelligent Character Sign Schematic Diagram (Welded Case Style)
667/GA/26185/000	Urban VMS Pulse Switcher
667/GA/26185/001	Urban VMS Lantern Control Unit
667/GA/26188/000}	Flip Dot Electronic Panel Diagrams for UVMS
667/GA/26188/001 }	
667/GA/26188/002 }	
667/GA/28085/ETC	Intelligent Character Electronic Panel Diagram for UVMS
667/GA/28085/100	Electronics Panel 2 & 3 Line Assembly

The drawings in this appendix are not included in the page numbering of this document.

D. MAINTENANCE KIT



E. MAINTENANCE PC SPECIFICATION

As minimum requirements, the Maintenance PC must have the following features:

Processor	486
Memory	16 Mbytes
Hard Disc	40 Mbytes
Floppy Disc	1.4 Mbytes
Serial Port	RS232C 9-way D connector (or other with suitable adapter to 9-way D)
Printer Port	25-way D connector (or other with suitable adapter to 25-way D)
Screen	800 x 600 Colour EGA
Operating System	Windows 95. Note: If support for Intelligent Character signs is not required, Windows 3.1 can be used, but not Windows 3.11
Keyboard	Full QWERTY
Power Supply	Mains or Battery
Optional	Mouse or Trackerball

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